

***Formula™ PTO Plus
Powered Seating
on
TDX® Wheelchairs
Pronto® M7I™ Wheelchairs
Pronto M9I™ Wheelchairs***

DEALER: Keep this manual. The procedures in this manual **MUST** be performed by a qualified technician.

For more information regarding
Invacare products, parts, and services,
please visit www.invacare.com



Yes, you can.®

WARNING

A QUALIFIED TECHNICIAN MUST PERFORM THE INITIAL SET UP OF THIS SEATING SYSTEM. ALSO, A QUALIFIED TECHNICIAN MUST PERFORM ALL PROCEDURES IN THIS SERVICE MANUAL.

DEALERS AND QUALIFIED TECHNICIANS: DO NOT SERVICE OR OPERATE THIS EQUIPMENT WITHOUT FIRST READING AND UNDERSTANDING (1) THE OWNER'S OPERATOR AND MAINTENANCE MANUAL, (2) THE SERVICE MANUAL (IF APPLICABLE) AND (3) THE SEATING SYSTEM'S MANUAL (IF APPLICABLE). IF YOU ARE UNABLE TO UNDERSTAND THE WARNINGS, CAUTIONS AND INSTRUCTIONS, CONTACT INVACARE TECHNICAL SUPPORT BEFORE ATTEMPTING TO SERVICE OR OPERATE THIS EQUIPMENT - OTHERWISE, INJURY OR DAMAGE MAY RESULT

USEFUL TERMS

The following acronyms are used throughout this manual:

ACRONYM	DEFINITION
TRSS	Tilt Recline Single Switch
SAC	Single Actuator Control
TRECM	Tilt Recline Elevate Control Module (used with TDX Wheelchairs only)
TAC	Two Actuator control
DLIAM	Dual Leg Integrated Actuator Module
QPB	Quad Push Button
FWT	4-Way Toggle Switch
4WSB	4-Way Switch Box
S4WSB	Multiple Actuator Interface Box
ASBA	Adjustable Seat and Back Angle seat frame (discontinued 7/4/05 on TDX, 8/7/05 on M7I and 10/3/05 on M9I).
ADJUSTABLE ASBA	Adjustable Width and Depth ASBA seat frame.

NOTE: Updated versions of these manuals, including this one, are available on www.invacare.com.

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SPECIAL NOTES

Signal words are used in this manual and apply to hazards or unsafe practices which could result in personal injury or property damage. Refer to the table below for definitions of the signal words.

SIGNAL WORD	MEANING
DANGER	Danger indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Warning indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Caution indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

THE INFORMATION CONTAINED IN THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE.

WHEELCHAIR USER

As a manufacturer of wheelchairs, Invacare endeavors to supply a wide variety of wheelchairs to meet many needs of the end user. However, final selection of the type of wheelchair to be used by an individual rests solely with the user and his/her healthcare professional capable of making such a selection.

WHEELCHAIR TIE-DOWN RESTRAINTS AND SEAT RESTRAINTS (TRBKTS)

TRBKTS includes four factory-installed wheelchair transport brackets. TRBKTS has not been crash-tested in accordance with WC 19. Use these transport brackets only to secure an unoccupied wheelchair during transport.

As of this date, the Department of Transportation has not approved any tie-down systems for transportation of a user while in a wheelchair, in a moving vehicle of any type. It is Invacare's position that users of wheelchairs should be transferred into appropriate seating in vehicles for transportation and use be made of the restraints made available by the auto industry. Invacare cannot and does not recommend any wheelchair transportation systems.

WARNING

TRANSPORT READY PACKAGES ARE NOT RETROFITTABLE TO EXISTING MODELS AND ARE NOT FIELD SERVICEABLE.

TDX Only - Battery support brackets MUST be installed at all times. Refer to TDX Batteries on page 173.

Invacare products are specifically designed and manufactured for use in conjunction with Invacare accessories. Accessories designed by other manufacturers have not been tested by Invacare and are not recommended for use with Invacare products. The seat positioning strap is a positioning belt only. It is not designed for use as a safety device withstanding high stress loads such as auto or aircraft safety belts. If signs of wear appear, belt **MUST** be replaced immediately.

Wheelchairs should be examined during maintenance for signs of corrosion (water exposure, incontinence, etc.). Electrical components damaged by corrosion should be replaced **IMMEDIATELY**.

Wheelchairs that are used by incontinent users and/or are frequently exposed to water may require replacement of electrical components more frequently.

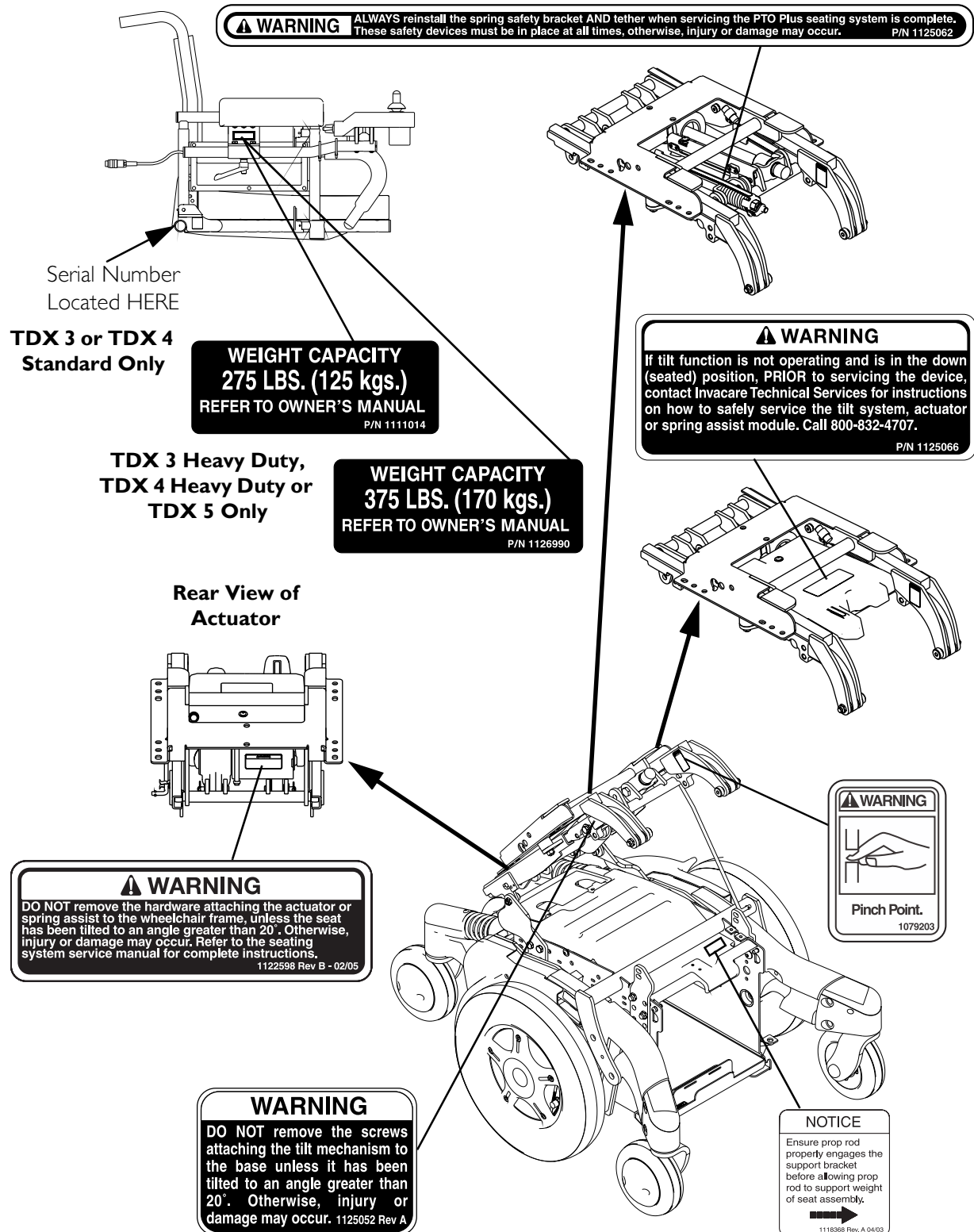
REFERENCE DOCUMENTS

Refer to the table below for part numbers of additional documents which are referenced in this manual.

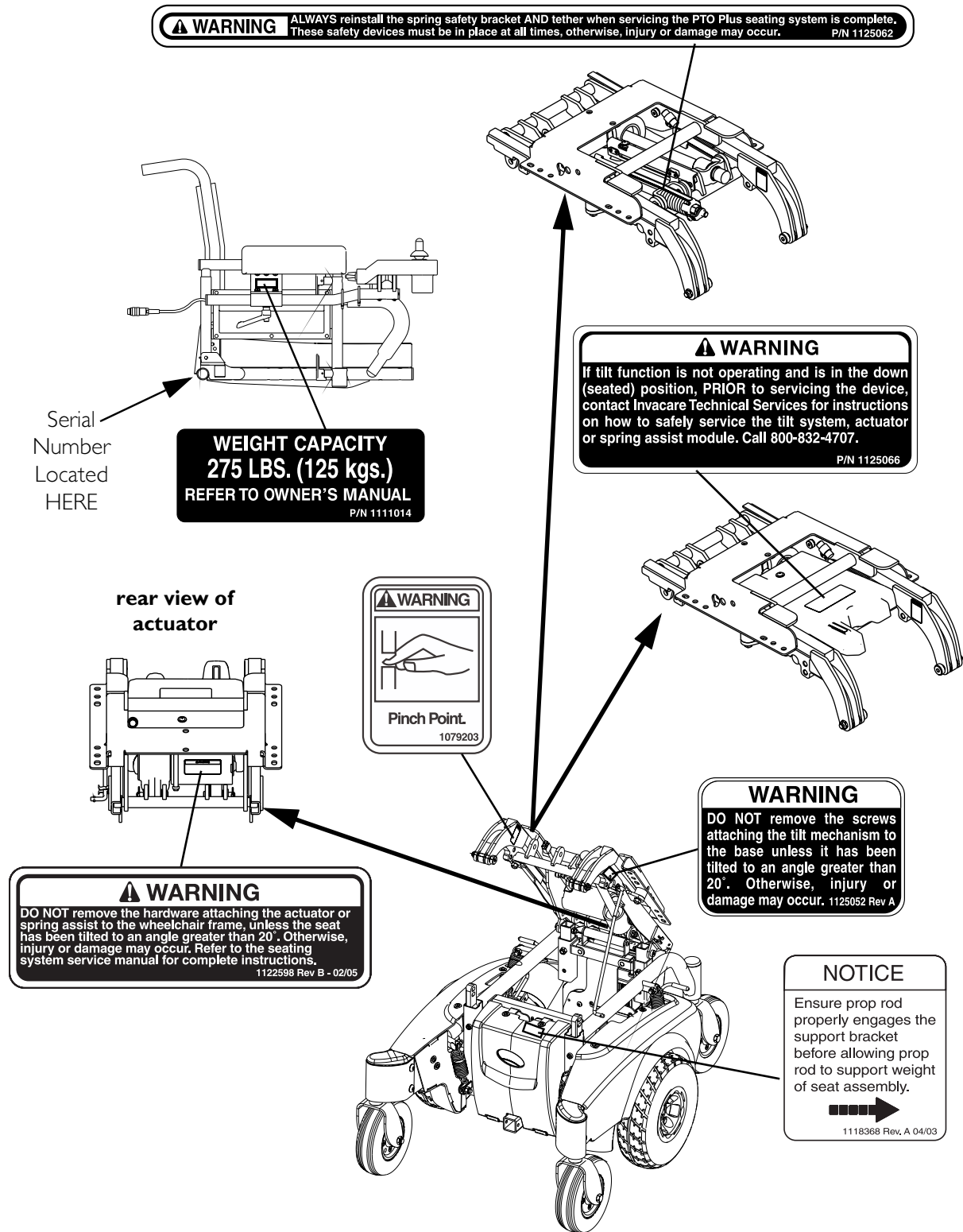
MANUAL	DESCRIPTION	PART NUMBER
Owner's	TDX - MK5™	1114809
	TDX Base Only - MK6i™	1143150
	Pronto M7I - MK5 before 1/24/06	1106631
	Pronto M7I - MK5 after 1/23/06	1141449
	Pronto M7I Base Only - MK6i	1143240
	Pronto M9I - MK5 before 1/24/06	1110560
	Pronto M9I - MK5 after 1/23/06	1141450
	Pronto M9I Base Only - MK6i	1143153
	Adjustable ASBA/PTO/PTO+ - MK6i	1143192
Service	TDX	1114819
	Pronto M7I	1118377
	Pronto M9I	1125038
Electronics	MK5 EX™ and TT-EX	1114808
	MK5 NX-80	1122140
	MK6i	1141471

LABEL LOCATIONS

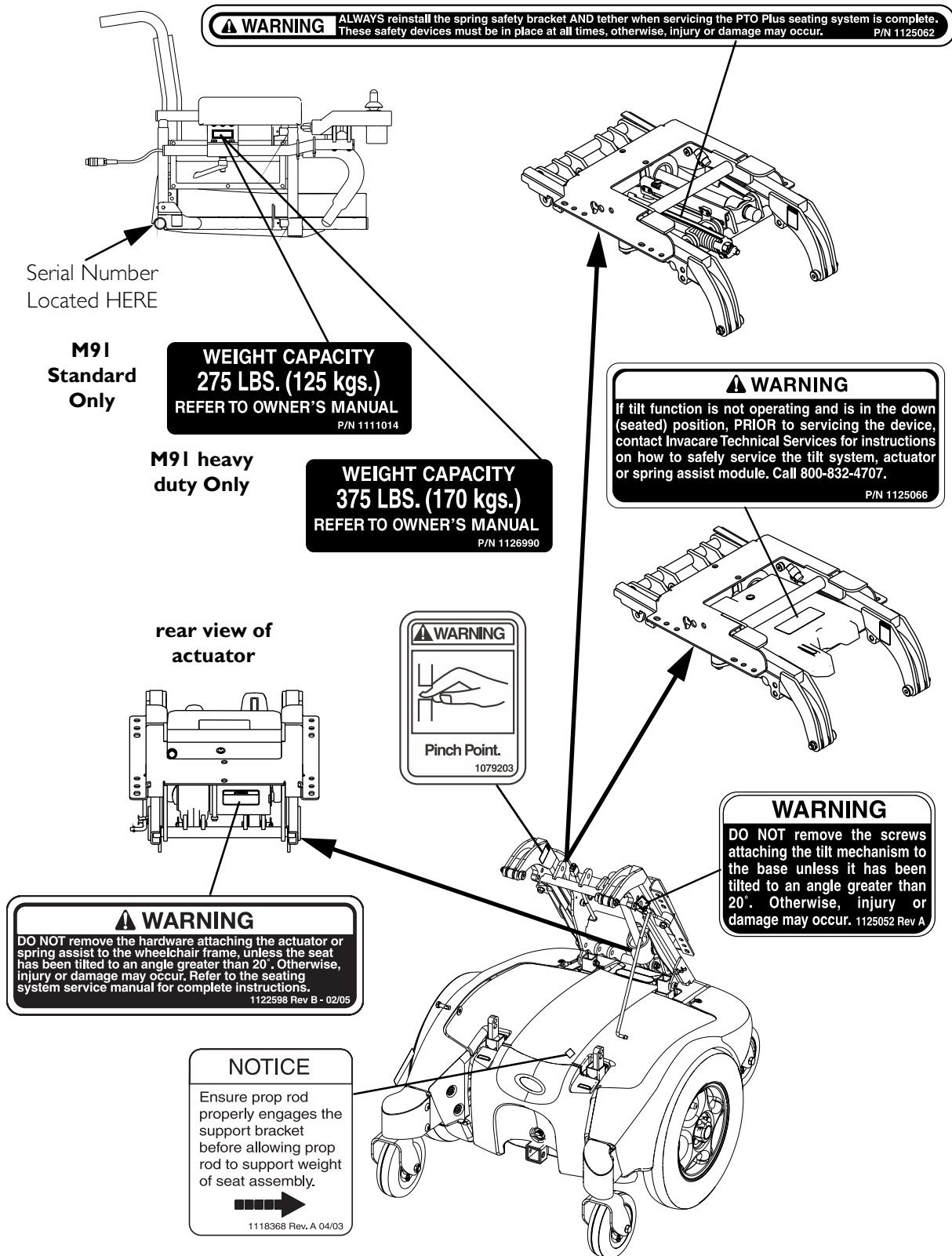
TDX Wheelchairs



M7I Wheelchairs



M9I Wheelchairs



TYPICAL PRODUCT PARAMETERS

TDX Wheelchairs

SEAT WIDTH RANGE:	16 - 22 inches
SEAT DEPTH RANGE (1-INCH INCREMENTS):	16 - 22 inches
BACK HEIGHT RANGE:	16 - 24 inches
SEAT-TO-FLOOR HEIGHT (ADJUSTABLE IN 1-INCH INCREMENTS):	18 to 20 inches \pm ¼ inch
OVERALL WIDTH WITH JOYSTICK AND TRSS:	27 inches
OVERALL HEIGHT:	37 - 45 inches
OVERALL LENGTH WITH FRONT RIGGINGS:	43¼ inches
BACK ANGLE RANGE (ASBA):	85 - 105° in 5° increments
TILT RANGE 0° SEAT PAN ANGLE: 5° SEAT PAN ANGLE:	0 - 55° 5 - 60°
TURNING RADIUS WITH FRONT RIGGINGS:	28 inches
SEAT CUSHION:	Cushion (Optional)
WEIGHT OF FORMULA PTO PLUS:	25 lbs
ARMRESTS:	Adjustable Angle, Height and Depth
WEIGHT LIMITATION PTO PLUS: PTO PLUS WITH HEAVY DUTY OPTION:	Up to 275 lbs Up to 375 lbs
<i>NOTE: All dimensions are \pm .50 inches unless otherwise indicated.</i>	

WARNING

If the seating system is mounted onto a power wheelchair that has a weight limitation greater than 275 lbs, the weight limitation of the wheelchair is 275 lbs. Example: If a seating system with a weight limitation of 275 lbs is mounted onto a power wheelchair with a weight limitation of 300 lbs, then the power wheelchair is restricted to a 275 lb weight limitation.

Pronto M7I Wheelchairs

SEAT WIDTH RANGE:	16 - 20 inches
SEAT DEPTH RANGE (1-INCH INCREMENTS):	16 - 20 inches
BACK HEIGHT RANGE:	16 - 24 inches
BACK ANGLE RANGE (ASBA):	85° to 105° in 5° increments
SEAT-TO-FLOOR HEIGHT*:	18 ± ¼ inch
OVERALL WIDTH WITHOUT JOYSTICK: WITH JOYSTICK AND TRSS:	24 inches 26 inches
OVERALL HEIGHT:	35¾ - 43¾ inches
OVERALL LENGTH WITH FRONT RIGGINGS:	43¼ inches
TILT RANGE 0° SEAT PAN ANGLE: 5° SEAT PAN ANGLE:	0 - 55° 5 - 60°
TURNING RADIUS WITH FRONT RIGGINGS:	28 inches
SEAT CUSHION:	Cushion (Optional)
WEIGHT OF FORMULA PTO PLUS:	25 lbs
ARMRESTS:	Adjustable Angle, Height and Depth
WEIGHT LIMITATION OF M7I WITH FORMULA PTO PLUS:	Up to 275 lbs

**NOTE: The seat-to-floor heights are based on 18-inch deep seat with 0° (±1°) seat pan angle and pneumatic tires or flat free inserts. Seat-to-floor height measured from the front edge of seat to floor. All heights are measured with properly inflated new tires. These heights can vary ±¼-inch.*

WARNING

If the seating system is mounted onto a power wheelchair that has a weight limitation greater than 275 lbs, the weight limitation of the wheelchair is 275 lbs. Example: If a seating system with a weight limitation of 275 lbs is mounted onto a power wheelchair with a weight limitation of 300 lbs, then the power wheelchair is restricted to a 275 lb weight limitation.

Pronto M9I Wheelchairs

SEAT WIDTH RANGE:	16 - 22 inches
SEAT DEPTH RANGE (1-INCH INCREMENTS):	16 - 22 inches
BACK HEIGHT RANGE:	16 - 24 inches
BACK ANGLE RANGE (ASBA):	85° to 105° in 5° increments
SEAT-TO-FLOOR HEIGHT (ADJUSTABLE)*:	18 - 20 inches in ½ inch increments
OVERALL WIDTH WITHOUT JOYSTICK: WITH JOYSTICK AND TRSS:	26 inches 27 inches
OVERALL HEIGHT:	37 - 45 inches
OVERALL LENGTH WITH FRONT RIGGINGS:	44 inches
TILT RANGE 0° SEAT PAN ANGLE: 5° SEAT PAN ANGLE:	0 - 55° 5 - 60°
TURNING RADIUS WITH FRONT RIGGINGS:	27½ inches
SEAT CUSHION:	Cushion (Optional)
WEIGHT OF FORMULA PTO PLUS:	25 lbs
ARMRESTS:	Adjustable Angle, Height and Depth
WEIGHT LIMITATION OF M9I WITH FORMULA PTO PLUS M9I STANDARD: M9I HEAVY DUTY OPTION:	Up to 275 lbs Up to 375 lbs

**NOTE: The seat-to-floor heights are based on 18-inch deep seat with 0° (±1°) seat pan angle and pneumatic tires or flat free inserts. Seat-to-floor height measured from the front edge of seat to floor. All heights are measured with properly inflated new tires. These heights can vary ±¼-inch.*

WARNING

If the seating system is mounted onto a power wheelchair that has a weight limitation greater than 275 lbs, the weight limitation of the wheelchair is 275 lbs. Example: If a seating system with a weight limitation of 275 lbs is mounted onto a power wheelchair with a weight limitation of 300 lbs, then the power wheelchair is restricted to a 275 lb weight limitation.

SECTION I—GENERAL GUIDELINES

WARNING

SECTION I - GENERAL GUIDELINES contains important information for the safe operation and use of this product. **DO NOT** use this product or any available optional equipment without first completely reading and understanding these instructions and any additional instructional material such as **Owner's Manuals, Service Manuals or Instruction Sheets** supplied with this product or optional equipment. If you are unable to understand the **Warnings, Cautions or Instructions**, contact a healthcare professional, dealer or technical personnel before attempting to use this equipment - otherwise, injury or damage may occur.

Repair or Service Information

Set-up of the Electronics Control Unit is to be performed only by a qualified technician. The final adjustments of the controller may affect other activities of the wheelchair. Damage to the equipment could occur if improperly set-up or adjusted.

Except for programming, **DO NOT** service or adjust the wheelchair while occupied, unless otherwise noted.

If tilt function is not operating and is in the down (seated) position, prior to servicing the device, refer to Tilt on page 103 for instructions on how to safely service the tilt system, actuator or spring assist module.

Always reinstall the spring safety bracket and tether when servicing the PTO Plus seating system is complete. These safety devices **MUST** be in place at all times, otherwise, injury or damage may occur.

A pinch point exists between head tube cap and walking beam.

A pinch point exists between walking beam/head tube cap and telescoping tube when the wheelchair is at the lowest seat to floor height.

Pinch point may occur when returning the tilted seat to the full upright position. Make sure the hands and body of the occupant, attendants and bystanders are clear of all pinch points before returning the tilted seat to the full upright position.

Before performing any maintenance, adjustments or service, **ALWAYS** turn the wheelchair power Off, otherwise injury or damage may result.

DO NOT install the spring assist assembly onto M71 wheelchairs. This option is for M91 and TDX wheelchairs only. Otherwise, injury or damage may occur.

Invacare products are specifically designed and manufactured for use in conjunction with Invacare accessories. Accessories designed by other manufacturers have not been tested by Invacare and are not recommended for use with Invacare products.

TRANSPORT READY PACKAGES ARE NOT RETROFITTABLE TO EXISTING MODELS AND ARE NOT FIELD SERVICEABLE.

TDX Wheelchairs with TRBKTS Only - Battery support brackets MUST be installed at all times. Refer to [TDX Batteries](#) on page 173.

Cables MUST be routed and secured properly to ensure that the cables DO NOT become entangled and damaged during normal operation of seating system.

Cables MUST be secured to the wheelchair frame and/or base with tie-wraps after servicing is complete. Failure to follow the warnings and instructions listed below will result in injury to the users, attendants and/or bystanders and/or damage to the wheelchair.

Cables MUST be secured so there are no loops of excess cable extending away from the wheelchair. Bundle all excess cable together and secure with a tie-wrap. It may also be necessary to secure these bundles to the frame and/or base.

ALWAYS test all wheelchair functions after securing the cables to ensure cables DO NOT get pinched or crushed during operation of the wheelchair.

M71 Wheelchairs Only - DO NOT adjust the seat height. Adjusting the seat height from the factory setting will make the wheelchair unstable and injury or damage may occur. The M71 wheelchair seat should only be mounted in mounting hole B (FIGURE 9.7 on page 92).

M91 Wheelchairs Only - DO NOT use Mounting Hole A. This mounting hole combination will cause interference between the front riggings and/or the seat frame and wheelchair base. Users over 250 lbs. MUST use Mounting Hole B. Mounting Holes C, D and E MUST only be used for users under 250 lbs. See FIGURE 9.7 on page 92.

DO NOT adjust rear seat posts higher than front seat posts.

All seat brackets or seat posts MUST be adjusted to the same height.

Wheelchairs should be examined during maintenance for signs of corrosion (water exposure, incontinence, etc.). Electrical components damaged by corrosion should be replaced IMMEDIATELY.

Wheelchairs that are used by incontinent users and/or are frequently exposed to water may require replacement of electrical components more frequently.

DO NOT overtighten hardware attaching to the frame. This could cause damage to the frame tubing.

Operation Information

Performance adjustments should only be made by professionals of the healthcare field or persons fully conversant with this process and the driver's capabilities. Incorrect settings could cause injury to the driver, bystanders, damage to the chair and to surrounding property.

After the wheelchair has been set-up/adjusted, check to make sure that the wheelchair performs to the specifications entered during the set-up procedure. If the wheelchair does not perform to specifications, turn the wheelchair off IMMEDIATELY and re-enter set-up specifications. Repeat this section until the wheelchair performs to specifications.

Avoid storing or using the wheelchair near open flame or combustible products. Serious injury or damage to property may result.

Use caution when driving in a tilted, reclined or elevated position.

DO NOT operate the seating system while on an incline.

DO NOT operate the seating system while the wheelchair is moving.

NEVER operate the wheelchair while in any tilted position over 20° relative to the vertical position. If the drive lock-out does not stop the wheelchair from operating in a tilt position over 20° relative to the vertical position, DO NOT operate the wheelchair. The drive lock-out settings MUST be adjusted. Refer to Adjusting/Replacing the Drive Lockout Sensor on page 136.

Use only TRECM (TDX only), SAC, TAC or TRSS actuator controls to activate the tilt functions. DO NOT use any other actuator controls. Such devices may result in excess heating and cause damage to the actuator and associated wiring and could cause a fire, death, physical injury or property damage. If such devices are used, Invacare shall not be liable and the limited warranty is void.

DO NOT attempt to lift the wheelchair by any removable (detachable) parts. Lifting by means of any removable (detachable) parts of a wheelchair may result in injury to the user or damage to the wheelchair.

ALWAYS keep hands and fingers clear of moving parts to avoid injury.

NEVER leave an unoccupied wheelchair unattended on an incline.

DO NOT stand on the frame of the wheelchair.

DO NOT leave the power button on when entering or exiting the wheelchair.

DO NOT use an escalator to move a wheelchair between floors. Serious bodily injury may occur.

DO NOT use the footplates as a platform. When getting in or out of the wheelchair, make sure that the footplates are in the upward position or swing footrests towards the outside of the wheelchair.

DO NOT engage or disengage the motor locks until the power is in the off position.

DO NOT operate tilt seat around children.

Keep hands and feet out from underneath tilt seat, otherwise serious injury may result.

DO NOT tip the wheelchair without assistance.

DO NOT store items under the seat.

DO NOT leave elevating legrests in the fully extended position when proceeding down ramps or slopes.

Tire Pressure

Ensure the wheelchair has the proper tire pressure (P.S.I.) before use. DO NOT overinflate the tires. Failure to follow these recommendations may cause the tire to explode and cause bodily harm. The recommended tire pressure is listed on the side wall of the tire.

Electrical

Grounding Instructions

DO NOT, under any circumstances, cut or remove the round grounding prong from any plug used with or for Invacare products. Some devices are equipped with three-prong (grounding) plugs for protection against possible shock hazards. Where a two-prong wall receptacle is encountered, it is the personal responsibility and obligation of the customer to contact a qualified electrician and have the two-prong receptacle replaced with a properly grounded three-prong wall receptacle in accordance with the National Electrical Code. If you must use an extension cord, use ONLY a three-wire extension cord having the same or higher electrical rating as the device being connected. In addition, Invacare has placed RED/ORANGE warning tags on some equipment. DO NOT remove these tags.

Batteries

The warranty and performance specifications contained in this manual are based on the use of deep cycle gel cell batteries. Invacare strongly recommends their use as the power source for this unit.

Carefully read battery/battery charger information prior to installing, servicing or operating your wheelchair.

Charging Batteries

⚠ DANGER

When using an extension cord, use only a three wire extension cord having at least 16 AWG (American Wire Gauge) wire and the same or higher electrical rating as the device being connected. Use of improper extension cord could result in risk of fire and electric shock. Three prong to two prong adapters should not be used. Use of three prong adapters can result in improper grounding and present a shock hazard to the user.

NEVER attempt to recharge the batteries by attaching cables directly to the battery terminals.

DO NOT attempt to recharge the batteries and operate the wheelchair at the same time.

DO NOT operate wheelchair with extension cord attached to the AC cable.

DO NOT attempt to recharge the batteries when the wheelchair has been exposed to any type of moisture.

DO NOT attempt to recharge the batteries when the wheelchair is outside.

DO NOT sit in the wheelchair while charging the batteries.

Pronto M71 and M91 Only - DO NOT attempt to recharge batteries using BOTH the on-board battery charger and an independent battery charger (plugged into the joystick charger port) at the same time. Doing so will reduce the life of the batteries.

READ and CAREFULLY follow the manufacturer's instructions for each charger (supplied or purchased). If charging instructions are not supplied, consult a qualified technician for proper procedures.

Ensure the pins of the extension cord plug are the same number, size, and shape as those on the charger.

DO NOT under any circumstances cut or remove the round grounding plug from the charger AC cable plug or the extension cord plug.

Weight Limitation

Refer to Typical Product Parameters on page 17 to determine the weight limit (total combined weight of user and any attachments) of your wheelchair and seating system. The weight limitation indicated overrides the weight limitation of the wheelchair by itself. DO NOT exceed the limit - otherwise, injury or damage may result.

SECTION 2—SAFETY/HANDLING OF WHEELCHAIRS

Pinch Points

⚠ WARNING

TDX Wheelchairs Only - Pinch points exist between the headtube cap and walking beam.

Pinch points may occur when returning the tilted seat to the full upright position. Make sure the hands and body of both the occupant and attendants/bystanders are clear of all pinch points before returning the tilted seat to the full upright position.

NOTE: For this procedure, refer to FIGURE 2.1.

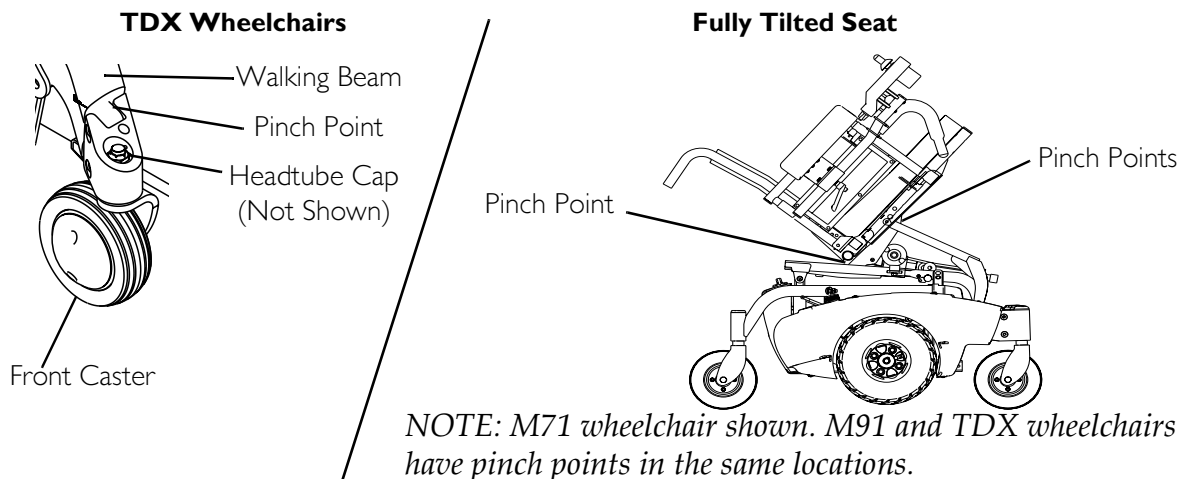


FIGURE 2.1 Pinch Points

SECTION 3—EMI INFORMATION

WARNING

CAUTION: IT IS VERY IMPORTANT THAT YOU READ THIS INFORMATION REGARDING THE POSSIBLE EFFECTS OF ELECTROMAGNETIC INTERFERENCE ON YOUR POWERED WHEELCHAIR.

Electromagnetic Interference (EMI) From Radio Wave Sources

Powered wheelchairs and motorized scooters (in this text, both will be referred to as powered wheelchairs) may be susceptible to electromagnetic interference (EMI), which is interfering electromagnetic energy (EM) emitted from sources such as radio stations, TV stations, amateur radio (HAM) transmitters, two way radios, and cellular phones. The interference (from radio wave sources) can cause the powered wheelchair to release its brakes, move by itself, or move in unintended directions. It can also permanently damage the powered wheelchair's control system. The intensity of the interfering EM energy can be measured in volts per meter (V/m). Each powered wheelchair can resist EMI up to a certain intensity. This is called its "immunity level." The higher the immunity level, the greater the protection. At this time, current technology is capable of achieving at least a 20 V/m immunity level, which would provide useful protection from the more common sources of radiated EMI.

There are a number of sources of relatively intense electromagnetic fields in the everyday environment. Some of these sources are obvious and easy to avoid. Others are not apparent and exposure is unavoidable. However, we believe that by following the warnings listed below, your risk to EMI will be minimized.

The sources of radiated EMI can be broadly classified into three types:

- 1) **Hand-held Portable transceivers** (transmitters-receivers with the antenna mounted directly on the transmitting unit. Examples include: citizens band (CB) radios, "walkie talkie", security, fire and police transceivers, cellular telephones, and other personal communication devices).

NOTE: Some cellular telephones and similar devices transmit signals while they are ON, even when not being used.

- 2) **Medium-range mobile transceivers**, such as those used in police cars, fire trucks, ambulances and taxis. These usually have the antenna mounted on the outside of the vehicle; and
- 3) **Long-range transmitters and transceivers**, such as commercial broadcast transmitters (radio and TV broadcast antenna towers) and amateur (HAM) radios.

NOTE: Other types of hand-held devices, such as cordless phones, laptop computers, AM/FM radios, TV sets, CD players, cassette players, and small appliances, such as electric shavers and hair dryers, so far as we know, are not likely to cause EMI problems to your powered wheelchair.

⚠ WARNING**Powered Wheelchair Electromagnetic Interference (EMI)**

Because EM energy rapidly becomes more intense as one moves closer to the transmitting antenna (source), the EM fields from hand-held radio wave sources (transceivers) are of special concern. It is possible to unintentionally bring high levels of EM energy very close to the powered wheelchair's control system while using these devices. This can affect powered wheelchair movement and braking. Therefore, the warnings listed below are recommended to prevent possible interference with the control system of the powered wheelchair.

Electromagnetic interference (EMI) from sources such as radio and TV stations, amateur radio (HAM) transmitters, two-way radios, and cellular phones can affect powered wheelchairs and motorized scooters.

FOLLOWING THE WARNINGS LISTED BELOW SHOULD REDUCE THE CHANCE OF UNINTENDED BRAKE RELEASE OR POWERED WHEELCHAIR MOVEMENT WHICH COULD RESULT IN SERIOUS INJURY.

- 1) **DO NOT** operate hand-held transceivers (transmitters receivers), such as citizens band (CB) radios, or turn **ON** personal communication devices, such as cellular phones, while the powered wheelchair is turned **ON**;
- 2) Be aware of nearby transmitters, such as radio or TV stations, and try to avoid coming close to them;
- 3) If unintended movement or brake release occurs, turn the powered wheelchair **OFF** as soon as it is safe;
- 4) Be aware that adding accessories or components, or modifying the powered wheelchair, may make it more susceptible to EMI (**NOTE:** There is no easy way to evaluate their effect on the overall immunity of the powered wheelchair); and
- 5) Report all incidents of unintended movement or brake release to the powered wheelchair manufacturer, and note whether there is a source of EMI nearby.

Important Information

- 1) 20 volts per meter (V/m) is a generally achievable and useful immunity level against EMI (as of May 1994) (the higher the level, the greater the protection);
- 2) This device has been tested to a radiated immunity level of 20 volts per meter.
- 3) The immunity level of the product is unknown.

Modification of any kind to the electronics of this wheelchair as manufactured by Invacare may adversely affect the EMI immunity levels.

SECTION 4—SAFETY INSPECTION/ TROUBLESHOOTING

Safety Inspection Checklist

NOTE: Initial adjustments should be made to suit the end user's personal body structure needs and preference. After initial setup, perform these procedures every time the wheelchair is serviced.

NOTE: Refer to the wheelchair service manuals listed in Reference Documents on page 13 for a complete safety inspection checklist for the base.

- ☐ Inspect for any loose hardware on seating system.
- ☐ Make sure all electrical connections are secure.
- ☐ Check that wiring is routed and secured properly to ensure that wiring does not become entangled and damaged during normal operation of seating system.
- ☐ Make sure drive lock-out works properly.
- ☐ Check sensor position.
- ☐ Make sure tilt operates smoothly and properly.
- ☐ Make sure actuator mechanism and tilt tracks are clean.
- ☐ Ensure all fasteners are secure on clothing guards.
- ☐ Ensure arms are secure but easy to release.
- ☐ Ensure arm adjustment levers operate and lock securely.
- ☐ Ensure adjustable height arms operate and lock securely.
- ☐ Ensure arm pivot points are not worn and/or loose. Replace if necessary.
- ☐ Ensure seat and/or back upholstery have no rips and DO NOT sag.
- ☐ Ensure seat is secured to wheelchair frame.
- ☐ Ensure seat latch is functional. Replace if necessary (M71 and M91 Only).
- ☐ Inspect for rips in upholstery on armrests.
- ☐ Ensure armrest pad sits flush against arm tube.
- ☐ Inspect hand grips for looseness. If loose, have them replaced by a qualified technician.
- ☐ Inspect seat positioning strap for any signs of wear. Ensure buckle latches. Verify hardware that attaches strap to frame is secure and undamaged. Replace if necessary.
- ☐ Clean upholstery and armrests.
- ☐ Check that all labels are present and legible. Replace if necessary.
- ☐ Inspect electrical components for signs of corrosion. Replace if corroded or damaged.

Post-Service Inspection Checklist

WARNING

NEVER operate the wheelchair while in any tilted/back angle position over 20° relative to the vertical position. If the drive lock-out does not stop the wheelchair from operating in a tilt position over 20° relative to the vertical position, **DO NOT** operate the wheelchair. The drive lock-out settings **MUST** be adjusted. Refer to Adjusting/Replacing the Drive Lockout Sensor on page 136.

ALWAYS test all wheelchair functions after securing the cables to be sure cables do not get pinched or crushed during operation of the wheelchair.

Cables **MUST** be secured to the wheelchair frame and/or base with tie-wraps after servicing is complete. Failure to follow the warnings and instructions listed below will result in injury to the users, attendants and/or bystanders and/or damage to the wheelchair.

Cables **MUST** be secured so there are no loops of excess cable extending away from the wheelchair. Bundle all excess cable together and secure with a tie-wrap. It may also be necessary to secure these bundles to the frame and/or base.

Follow this checklist after service has been completed and cables have been secured:

- ☐ Verify all attaching hardware is tightened securely.
- ☐ Make sure drive lock-out engages when the wheelchair is in any tilt/back angle combination over 20° relative to the vertical position.
- ☐ Cycle system up and down to verify wiring harnesses do not obstruct the path of the system. If they do, perform one of the following:
 - Wires were damaged during inspection - Replace damaged wires.
 - Wires were not damaged during inspection - Cut tie-wraps and relocate wires to a location where they will not become damaged. Refer to Securing the Cables on page 145.
- ☐ Ensure there is no interference with the base frame when the system is fully tilted.
- ☐ With the wheelchair unoccupied, test all system functions to verify proper operation.
- ☐ Verify charger function.
- ☐ Verify front casters will not collide with legrests when fully swiveled.
- ☐ Verify easy removal of arms and legrests.
- ☐ Install all shrouds.

Troubleshooting

NOTE: Refer to the wheelchair service manuals listed in [Reference Documents](#) on page 13 for complete mechanical and electrical troubleshooting guides for the base and an explanation of error codes.

MK5 Electronics

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Wheelchair Power ON but does not drive.	System tilted beyond drive lock-out angle (20°). Check motor locks. Speed set too low. Battery charger connected.	Return to neutral position (upright). Refer to Operating the Powered Tilt System on page 104. If this does not work, adjust the sensors. Refer to Adjusting/Replacing the Drive Lockout Sensor on page 136 or Adjusting/Replacing the Tilt Sensor on page 141. Engage motor locks to drive wheelchair. Adjust speed setting. Disconnect battery charger.
Seating system not functioning or working intermittently.	Low batteries. Faulty electrical connection. Blown fuse. Seat has been driven under a heavy load for an extended period of time.	Charge batteries. Check all connections. Replace the wiring harness. Refer to the wheelchair owner's or service manual. Allow time for the electronics to cool down (Light Duty Use).
Error Code: E28 - MPJ joystick or 5 flashes - DPJ and SPJ-80 joysticks.	System tilted beyond drive lock-out angle (20°).	Return to neutral position (upright). Refer to Operating the Powered Tilt System on page 104. If this does not work, adjust the sensors. Refer to Adjusting/Replacing the Drive Lockout Sensor on page 136 or Adjusting/Replacing the Tilt Sensor on page 141.
Programmer does not work or gives "communication error."	System tilted beyond drive lock-out angle (20°).	Return to neutral position (upright). Refer to Operating the Powered Tilt System on page 104. If this does not work, adjust the sensors. Refer to Adjusting/Replacing the Drive Lockout Sensor on page 136 or Adjusting/Replacing the Tilt Sensor on page 141.




MK6i Electronics





SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Wheelchair Power On but does not drive.	System tilted or reclined beyond drive lock-out angle (20°).	Return to neutral position (upright and completely lowered). Refer to <u>Operating the Powered Tilt System</u> on page 104. Contact Invacare if this does not solve the problem.
	Motor lock levers are disengaged.	Engage motor lock levers. See wheelchair base owner's manual.
	Speed set too low.	Adjust speed setting.
	Battery charger connected.	Disconnect battery charger.
Seating system not functioning or working intermittently.	Low batteries.	Charge batteries.
	Faulty electrical connection.	Check all connections. Ensure network connectors are connected properly and caps are installed on both ends of the series of network connectors. Refer to <u>Connecting/Disconnecting Network Connectors</u> on page 120.
	Seat has been driven under a heavy load for an extended period of time.	Allow time for the electronics to cool down (Light Duty Use).

SPJ™ + w/PSS or SPJ+ w/ACC Joysticks

The joystick information gauge and the service indicator display the type of fault or error detected by the control module. When a fault is detected, the wheelchair may stop and not drive. The LEDs on the information gauge may flash in a particular pattern or the service indicator light will flash. The number or type of flashes indicates the nature of the error. If multiple errors are found, only the first error encountered by the control module will be displayed.

Information Gauge Display Diagnostics

DISPLAY	DESCRIPTION	DEFINITION	COMMENTS
 <p>Information Gauge Display</p>			
	All LEDs are off.	Power is off.	
	All LEDs are on.	Power is on.	Fewer than three LEDs on implies reduced battery charge.

DISPLAY	DESCRIPTION	DEFINITION	COMMENTS
			
	Left RED LED is flashing.	Battery charge is low.	The batteries should be charged as soon as possible.
	Left to Right “chase” alternating with steady display.	Joystick is in programming, inhibit and/or charging mode.	The steady LEDs indicate the current state of the battery charge.
	All LEDs are flashing slowly.	Joystick has detected Out-of-Neutral-at-Power-Up mode.	Release the joystick back to Neutral.













Service Indicator Light Diagnostics

NUMBER OF FLASHES	DIAGNOSTICS CODE	ERROR CODE DESCRIPTION	SUB CODE*	DETAILS OF ERROR CODE	POSSIBLE SOLUTION
1	E 01	User Fault	00	Stall Timeout or user error.	Release joystick to neutral and try again.
2	E02	Battery Fault	00	Recharge batteries or replace.	Check the batteries and cable. Try charging the batteries. Batteries may require replacing.
3	E03	Left Motor Fault	00	Left Motor Short Circuit	Check the left motor, connections and motor cable.
			01	Left Motor Open Circuit	
			02	Left Motor Connection Fault B-	
			03	Motor Terminal Connected to B+	
			04	Left Motor Voltage Fault	
			05	Left Motor Bridge Fault	
			06	Too Many Hardware Current Limit Events	
			07	Current Offset Out of Range	
			08	Hardware Current Limit Fault	

NUMBER OF FLASHES	DIAGNOSTICS CODE	ERROR CODE DESCRIPTION	SUB CODE*	DETAILS OF ERROR CODE	POSSIBLE SOLUTION
4	E04	Right Motor Fault	00	Right Motor Short Circuit	Check the right motor, connections and motor cable.
			01	Right Motor Open Circuit	
			02	Right Motor Connection Fault B-	
			03	Motor Terminal Connected to B+	
			04	Right Motor Voltage Fault	
			05	Right Motor Bridge Fault	
			06	Too Many Hardware Current Limit Events	
			07	Current Offset Out of Range	
			08	Hardware Current Limit Fault	
5	E05	Left Park Brake Fault	00	Left Park Brake Drive-Time Test Failed	Check the left park brake connections and cable.
			01	Left Park Brake Output Enabled When Wheelchair Idle	
			02	Left Park Brake Output Did not Enable When Entering Drive Mode	
			03	Left Park Brake fault during power-up testing	
			04	Left park brake feedback low during drive (park brake short)	
6	E06	Right Park Brake Fault	00	Right Park Brake Drive-Time Test Failed	Check the right park brake connections and cable.
			01	Right Park Brake Output Enabled When Wheelchair Idle	
			02	Right Park Brake Output Did not Enable When Entering Drive Mode	
			03	Right Park Brake fault during power-up testing	
			04	Right park brake feedback low during drive (park brake short)	

NUMBER OF FLASHES	DIAGNOSTICS CODE	ERROR CODE DESCRIPTION	SUB CODE*	DETAILS OF ERROR CODE	POSSIBLE SOLUTION
7	E07	Remote Fault	00	Local SR Fault (CPU, EEPROM, etc.)	Check the communications bus, connections and wiring. Replace the remote.
			01	Joystick fault at the remote	
			02	Speed pot fault at the remote	
8	E08	Controller Fault	00	Controller fault	Check connections and wiring. Replace power module.
			01	RAM fault	
			02	ROM fault	
			03	CPU fault	
			04	EEPROM fault	
			05	Watchdog fault	
			06	Stack fault	
			07	Software fault	
			08	Power-up testing fault	
			09	Relay fault or precharge fault	
			10	Bridge fault or disable all fault	
			11	Electronics fault: Thermistor	
			12	Calibration setting fault	
9	E09	Communications Fault	00	Remote connection lost	Check connections and wiring. Replace Bus cable.
			01	Low communication mode	
10	E10	General Fault	00	General fault	Check all connections and wiring. Contact Invacare Technical Service.
11	E11	Incompatible/incorrect Remote	00	Incompatible/incorrect Remote	Wrong type of remote connected. Ensure the branding of the joystick matches that of controller unit.

MPJ™ +, PSR, PSF Joysticks or Displays

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
 SPM L Park Brake Fault or  SPM R Park Brake Fault displays and wheelchair does not drive.	Motor lock levers disengaged (Error code E9 or E10).	Engage motor lock levers.
CHARGER PLUGGED IN displays.	Battery charger connected (Error code E28).	Unplug battery charger from the wheelchair. Refer to Charging Batteries on page 157, page 167 or page 186.
 SPM Battery Fault displays and the wheelchair does not drive.	Batteries need to be charged (Error code E14).	Charge batteries. Refer to Charging Batteries on page 157, page 167 or page 186. If batteries fail to charge properly, check battery charger or replace batteries. Refer to Installing/Removing the Batteries on page 152, page 162 or page 175.
 JOYSTICK TIMEOUT displays and the wheelchair does not drive.	Joystick or input device is disconnected (Error code 32).	Turn off power, reconnect the joystick of input device and turn power on.
 JS REV TOO LARGE  JS FWD TOO LARGE  JS LFT TOO LARGE or  JS RGT TOO LARGE displays and the wheelchair does not drive.	The joystick or input device is sending a value outside of the reverse, forward, left or right limits (Error codes E01, E02, E03 or E04).	Replace joystick or input device.
NEUTRAL TESTING displays.	The joystick neutral test has failed (Error code E18).	Release the joystick and try to get the joystick back into the center-most position.
 BAD JOYSTICK CAL VALUES displays and the wheelchair does not drive.	The joystick calibration values are outside of the expected range (Error code E19).	See electronics manual for recalibration of the joystick (joystick throw procedure).
 SPM NOT CONNECTED	The MPJ or Display module is not communicating with the control module (Error code E200).	Check the connections between the joystick or display and the controller. Turn the power off and then back on. Replace the controller if necessary.
 SPM Communications Fault displays and the wheelchair drives slowly.	The controller has determined a fault during a previous turn-off process (Error code E41).	Turn the wheelchair off and back on.
ATTENDANT ACTIVE and  displays.	The Proportional or Digital Attendant control is active and can be used to drive the chair (Error code W05).	This is normal behavior.
Batteries draw excessive current when charging.	Battery failure.	Have batteries checked for shorted cell. Replace if necessary.
	Electrical malfunction.	Contact Invacare.

SECTION 4—SAFETY INSPECTION/TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	SOLUTIONS
Battery indicator flashes the charge level is low - immediately after recharge.	Battery failure.	Check batteries for shorted cell. Replace if necessary.
	Malfunctioning battery charger.	Replace charger.
	Electrical malfunction.	Contact Invacare.
Battery indicator flashes the charge level is low - too soon after being recharged.	Batteries not charged.	Have charger checked.
	Weak batteries.	Replace batteries if necessary. Refer to <u>Installing/Removing the Batteries</u> on page 152, page 162 or page 175.
Motor “chatters” or runs irregular.	Electrical malfunction.	Contact Invacare.
Joystick erratic or does not respond as desired.	Damaged motor coupling.	Inspect motor coupling. See service manual for wheelchair base.
	Electrical malfunction.	Contact Invacare for Service.
	Controller programmed improperly.	Check programming. See electronics manual.
Wheelchair does not respond to commands.	Poor battery terminal connection.	Have terminals cleaned.
Power indicator off - even after recharging.	Electrical malfunction.	Contact Invacare.

SECTION 5—RETROFITTING A SEATING SYSTEM

⚠ WARNING

After any adjustments, repair or service and before use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

Before performing any maintenance, adjustments or service, always turn the wheelchair power off, otherwise injury or damage may result.

Pinch points exist between seat and base frames. Use caution, otherwise injury may occur.

Cables **MUST** be secured to the wheelchair frame and/or base with tie-wraps after servicing is complete. Failure to follow the warnings and instructions below could result in injury to the users, attendants and/or bystanders and/or damage to the wheelchair.

Cables **MUST** be secured so there are no loops of excess cable extending away from the wheelchair. Bundle all excess cable together and secure with a tie-wrap. It may also be necessary to secure these bundles to the frame and/or base.

ALWAYS test all wheelchair functions after securing the cables to be sure cables **DO NOT** get pinched, crushed or pulled during operation of the wheelchair.

⚠ TRANSPORT READY WARNINGS

TRRO includes four factory-installed transport brackets and a wheelchair anchored pelvic belt. TRRO has been crash-tested in accordance with ANSI/RESNA WC Vol I Section 19 Frontal Impact Test requirements for wheelchairs with a 168 lb crash dummy, which corresponds to a person with a weight of 114 to 209 lbs.

TRBKTS includes four factory-installed wheelchair transport brackets. TRBKTS has not been crash-tested in accordance with WC 19. Use these transport brackets only to secure an unoccupied wheelchair during transport.

TDX Wheelchairs with TRRO Only - The installation of this kit will void TRRO compliance. **DO NOT** transport the wheelchair in a motor vehicle while occupied. The wheelchair may only be transported in a motor vehicle while unoccupied, and will be considered TRBKTS.

TDX Wheelchairs with TRBKTS - Battery support brackets **MUST** be installed at all times.

Pronto Wheelchairs with TRRO or TRBKTS - The installation of this kit will void TRRO compliance and the wheelchair will be considered TRBKTS. **DO NOT** transport the occupied wheelchair in a motor vehicle.

After installing battery door, ensure that the mounting screws on the side of the battery door are fully engaged into the side of the battery box.

Overview

The PTO Plus retrofit kit will contain a full assembly (seat, back, tilt actuator and electronics) that **MUST** be attached to the wheelchair base. The retrofit kit and these instructions are only for a system with MK5 electronics. The following checklist provides an overview of the procedures necessary to install the PTO Plus seating system onto the TDX, M71 or M91 base.

- ☐ Remove the existing seat pan.
- ☐ Remove the flip back armrests.
- ☐ Remove the existing seat (including the back).
- ☐ Remove the existing seat frame mounting hardware.
- ☐ Install the new seat mounting hardware.
- ☐ Install the new seat assembly.
- ☐ Connect the cables.
- ☐ Perform the post-inspection checklist. Refer to [Post-Service Inspection Checklist](#) on page 29.
- ☐ TDX Wheelchairs with TRRO Only - Install the TRRO non-compliance label and inform the wheelchair user of the change in transport ready status to TRBKTS.
- ☐ Pronto Wheelchairs with TRRO or TRBKTS - Inform the wheelchair user of the change in transport ready status.

Removing the Existing Seat Pan

Wheelchairs with ASBA Seats

NOTE: For this procedure, refer to FIGURE 5.1 on page 39.

1. Remove the seat cushion by lifting up and disengaging from strips on the seat pan.
2. Remove the two long hex screws and locknuts that secure the seat pan, seat positioning strap and pull pin to the seat frame.
3. Remove the four short hex screws, spacers, and locknuts that secure the seat pan to the seat frame.
4. Remove the seat pan.
5. Remove the batteries. Refer to one of the following sections of the manual:
 - Refer to [TDX Batteries](#) on page 173.
 - Refer to [M71 batteries](#) on page 161.
 - Refer to [M91 Batteries](#) on page 151.
6. Remove the flip back armrests. Refer to [Removing the Flip Back Armrests](#) on page 40.

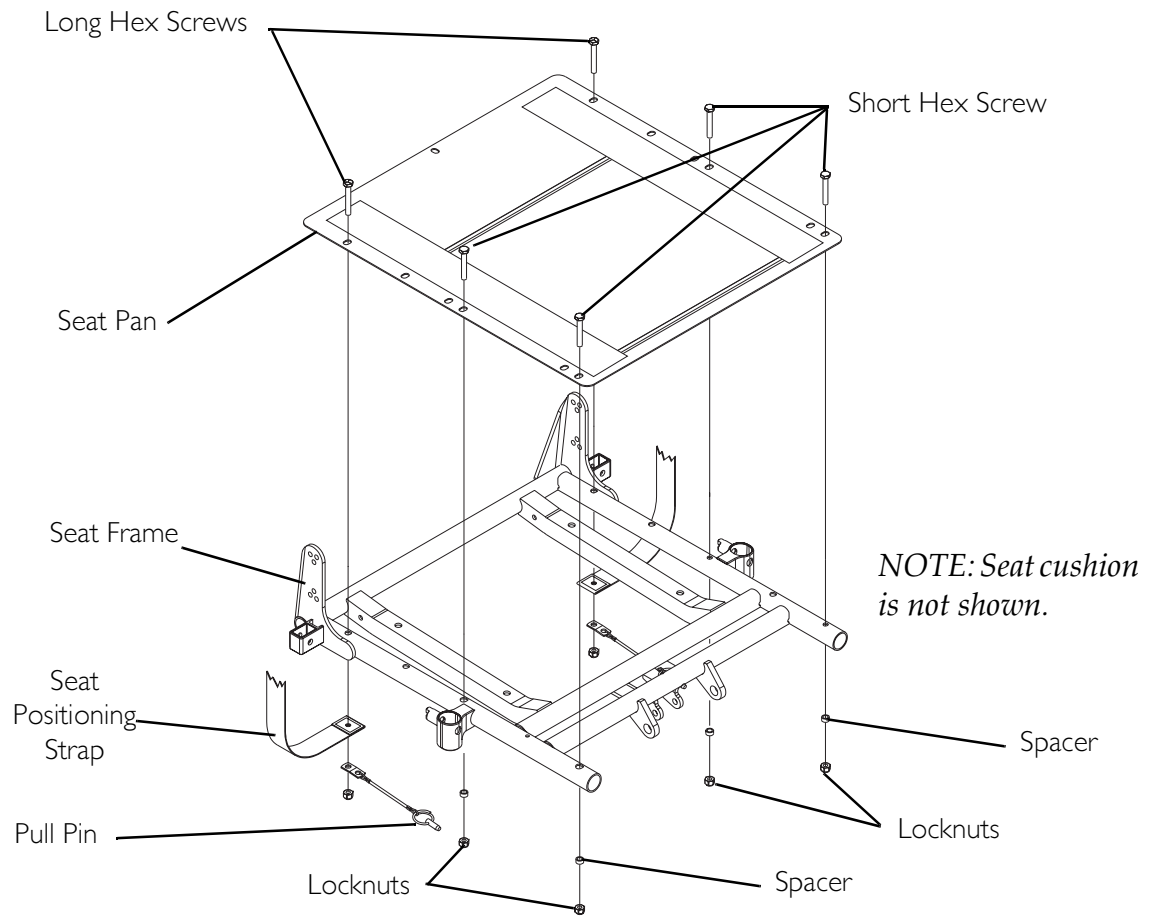


FIGURE 5.1 Removing the Existing Seat Pan - Wheelchairs with ASBA Seats

Wheelchairs with Adjustable ASBA Seats

NOTE: For this procedure, refer to FIGURE 5.2.

1. Remove the seat cushion.
2. Remove the two socket screws securing the seat pan to the seat frame.
3. Remove the seat pan from the seat frame.
4. Remove the batteries. Refer to one of the following sections of the manual:
 - Refer to [TDX Batteries](#) on page 173.
 - Refer to [M71 batteries](#) on page 161.
 - Refer to [M91 Batteries](#) on page 151.
5. Remove the flip back armrests. Refer to [Removing the Flip Back Armrests](#) on page 40.

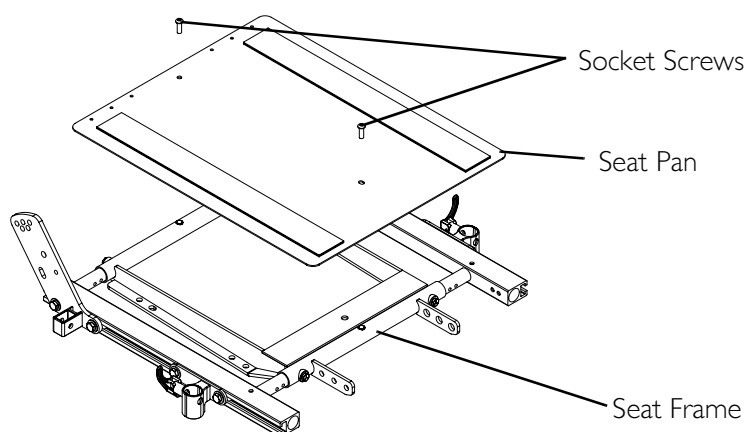


FIGURE 5.2 Removing the Existing Seat Pan - Wheelchairs with Adjustable ASBA Seats

Removing the Flip Back Armrests

NOTE: For this procedure, refer to FIGURE 5.3 on page 41.

1. Unlock flip back armrest by pulling flip back armrest release lever into the UNLOCKED (HORIZONTAL) position.
2. Remove the quick release pin that secures the flip back armrest to the wheelchair frame.
3. Pull UP on the flip back armrest and remove the armrest from the arm sockets.
4. Repeat STEPS 1-3 for the opposite flip back armrest.
5. Remove the existing seat assembly. Refer to [Removing the Existing Seat Assembly](#) on page 41.

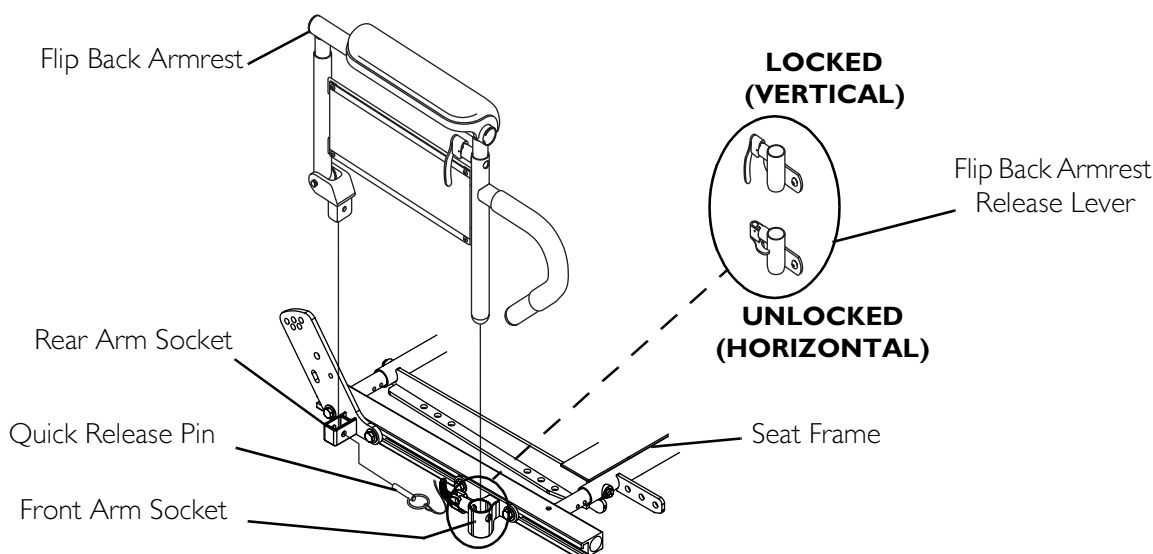


FIGURE 5.3 Removing the Flip Back Armrests

Removing the Existing Seat Assembly

NOTE: The seat assembly includes the back canes and back upholstery.

NOTE: Refer to the following procedures to remove the existing seat frame:

- Refer to TDX Wheelchairs with ASBA Seats on page 41.
- Refer to TDX Wheelchairs with Adjustable ASBA Seats on page 42.
- Refer to M71 and M91 Wheelchairs on page 43.

TDX Wheelchairs with ASBA Seats

NOTE: For this procedure, refer to FIGURE 5.4 on page 42.

1. Disconnect the joystick from the controller.
2. Perform one of the following:
 - Low Seat to Floor Height (Detail "A") -
 - i. Remove the two hex screws that secure the seat frame to the front upper seat brackets.
 - ii. Remove the two hex screws, flat washers and locknuts that secure the seat frame to the low seat to floor rear mounting plates.
 - Medium and High Seat-To-Floor Height (Detail "B") - Remove the four hex screws, flat washers and locknuts that secure the seat frame to the medium seat to floor mounting plates.
3. Remove the seat frame.
4. Remove the seat frame mounting hardware from the TDX. Refer to Removing the Existing Seat Frame Mounting Hardware on page 45.

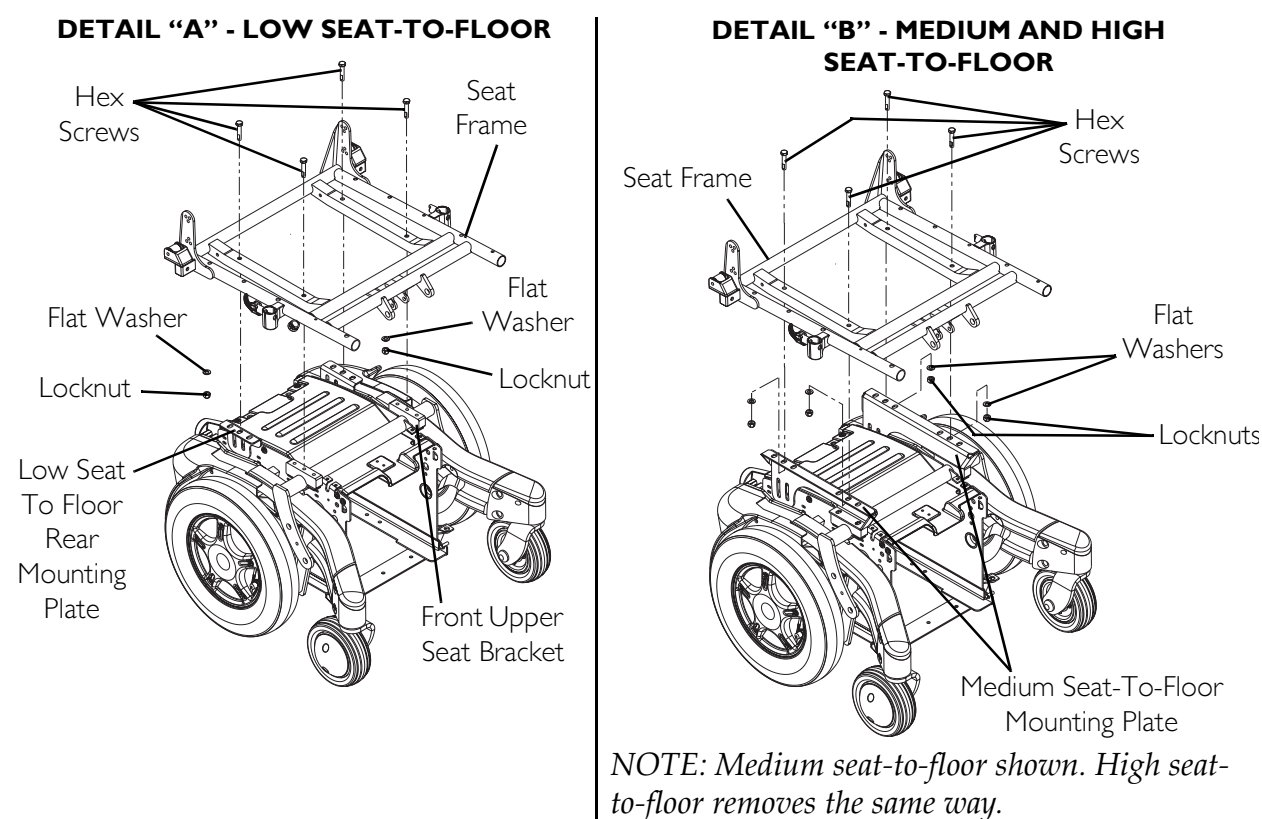


FIGURE 5.4 Removing the Existing Seat Assembly - TDX Wheelchairs with ASBA Seats

TDX Wheelchairs with Adjustable ASBA Seats

NOTE: For this procedure, refer to FIGURE 5.5 on page 43.

1. Remove the four socket screws and two locknuts that secure the seat frame to the front upper seat brackets and the seat-to-floor brackets.
2. Remove the seat frame.
3. Remove the seat frame mounting hardware. Refer to Removing the Existing Seat Frame Mounting Hardware on page 45.

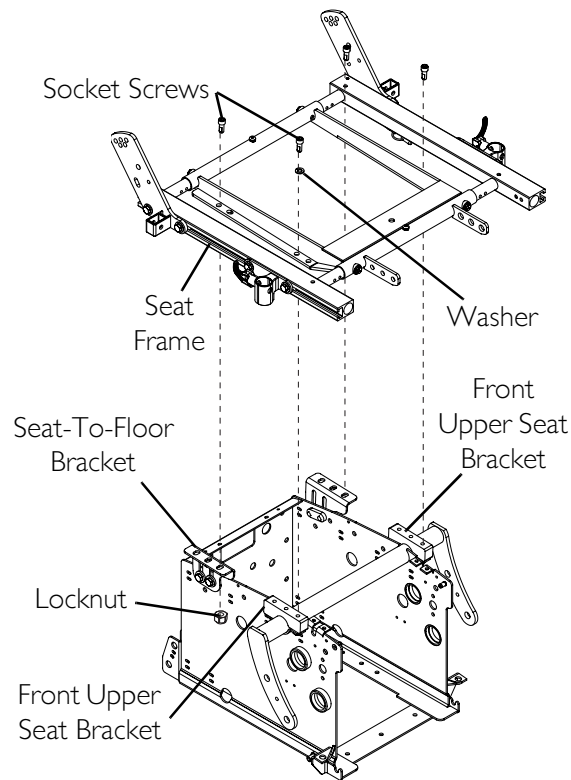
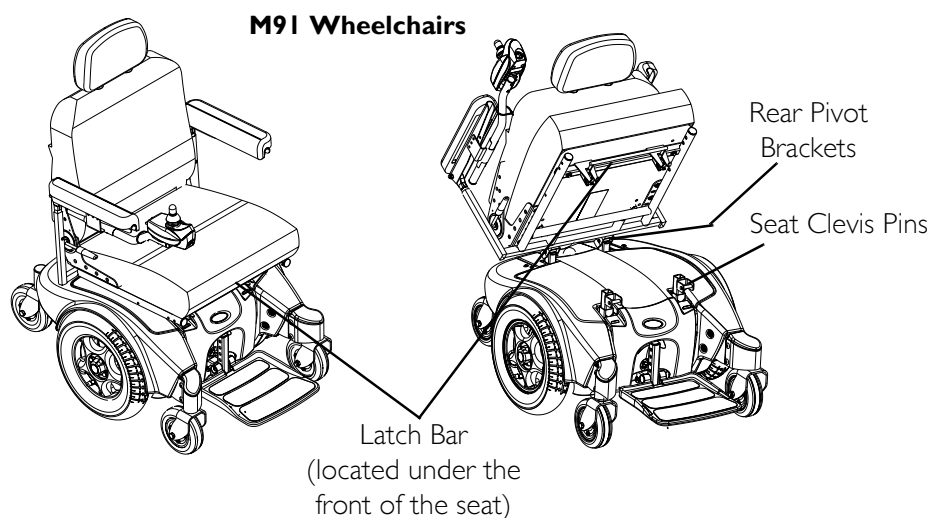
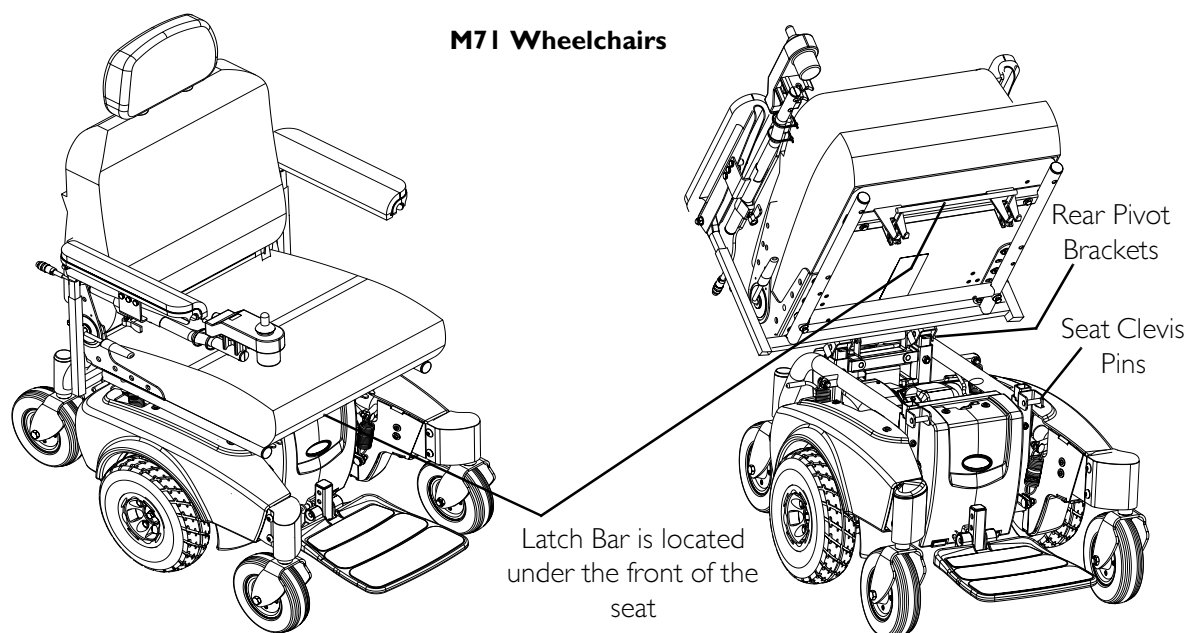


FIGURE 5.5 Removing the Existing Seat Assembly - TDX Wheelchairs with Adjustable ASBA Seats

M7I and M9I Wheelchairs

NOTE: For this procedure, refer to FIGURE 5.6 on page 44.

1. Disconnect the joystick cable at rear of seat.
2. Push down on the latch bar underneath front of seat.
3. Rotate seat assembly backward.
4. Slide the seat assembly forward to disengage seat from pivot brackets located in the rear.
5. Remove the existing seat frame mounting hardware. Refer to Removing the Existing Seat Frame Mounting Hardware on page 45.



NOTE: Van Seat model shown. ASBA and Adjustable ASBA seat removes/installs in the same way.

FIGURE 5.6 Removing the Existing Seat Assembly - M7I and M9I Wheelchairs

Removing the Existing Seat Frame Mounting Hardware

TDX Wheelchairs

NOTE: For this procedure, refer to FIGURE 5.7.

1. Remove the two hex screws, flat washers and strap nut that secure the seat-to-floor mounting plate to the battery box.
2. Medium and High Seat-To-Floor Only - Remove the two hex screws that secure the seat-to-floor mounting plate to the front upper seat bracket (Detail "B").
3. Remove the seat-to-floor mounting plate.
4. Repeat STEPS 2-3 for the remaining seat-to-floor mounting plate.
5. Remove the four hex screws that secure the front lower seat brackets and front upper seat brackets to the support beam tube.
6. Remove the front upper seat brackets and front lower seat brackets.
7. Install the seat mounting hardware. Refer to Installing New Seat Mounting Hardware on TDX on page 46.

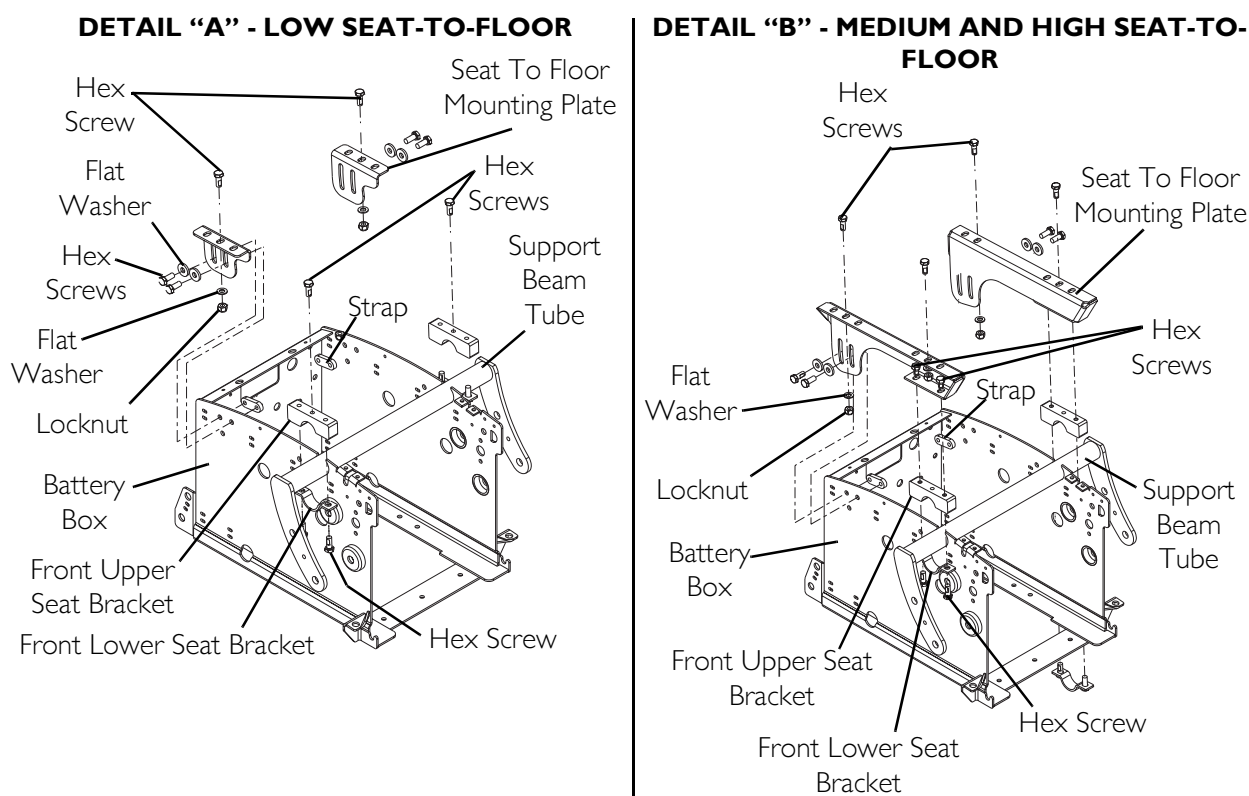


FIGURE 5.7 Removing the Existing Seat Frame Mounting Hardware - TDX Wheelchairs

M71 and M91 Wheelchairs

NOTE: For this procedure, refer to FIGURE 5.8.

1. Remove the side shrouds from the wheelchair. Refer to the wheelchair owner's manual for this procedure.
2. Remove the mounting screws and locknuts securing the front adjustable height tubes to the front support tubes.
3. Remove the front adjustable height tubes from the front support tubes.
4. Remove the mounting screws and locknuts securing the rear adjustable height tubes to the rear support tubes.
5. Remove the rear adjustable height tubes from the rear support tubes.
6. Install the new seat mounting hardware. Refer to Installing New Seat Mounting Hardware on M71 and M91 on page 48

NOTE: M71 wheelchair shown. M91 adjustable height tubes remove the same way.

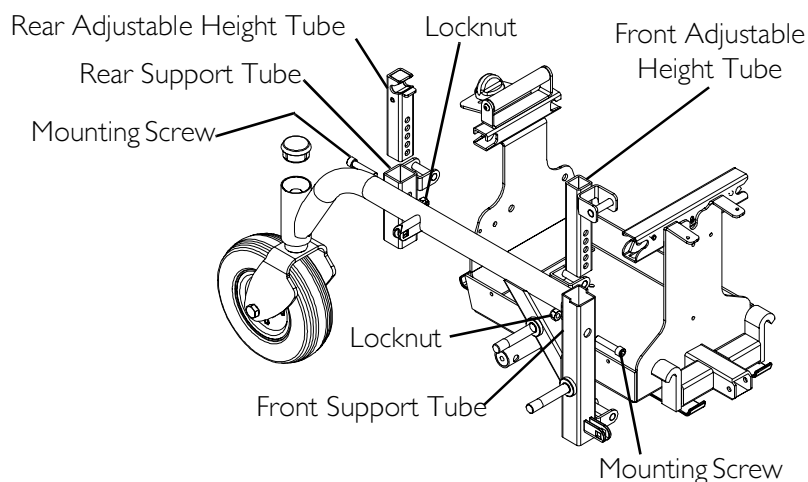


FIGURE 5.8 Removing the Existing Seat Frame Mounting Hardware - M71 and M91 Wheelchairs

Installing the New Seat Mounting Hardware

Installing New Seat Mounting Hardware on TDX

⚠ WARNING

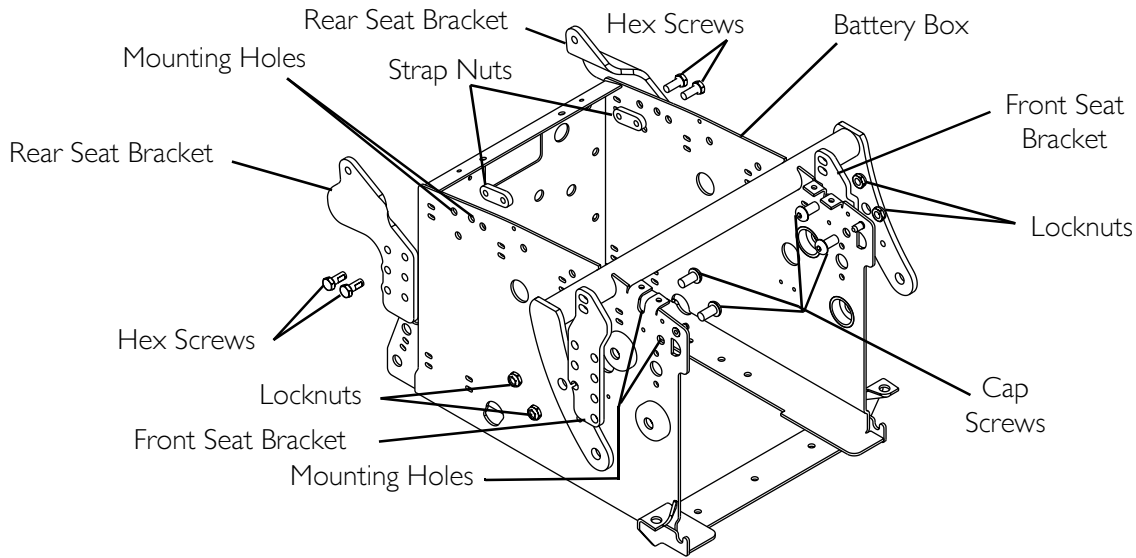
All seat brackets *MUST* be adjusted to the same height.

NOTE: For this procedure, refer to FIGURE 5.9 on page 47.

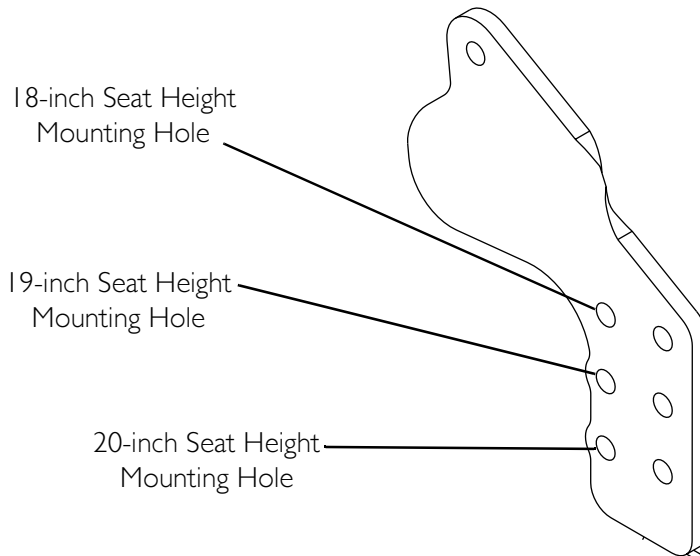
NOTE: The seat height can be adjusted to one of three positions for 18, 19 or 20-inches.

1. Position one rear seat bracket at the desired height.
2. Secure the rear seat bracket to the battery box with two hex screws and one strap nut. Torque to 13 ft-lbs \pm 20%.

3. Repeat STEPS 1 and 2 for the remaining rear seat bracket, using the same set of mounting holes used in STEP 2.
4. Using the same set of mounting holes used in STEP 2, secure the front seat bracket to the battery box using two cap screws and locknuts. Torque locknuts to 23 ft-lbs \pm 20%.
5. Repeat STEP 4 for the remaining front seat bracket.
6. Install the seat assembly. Refer to Installing the Seat Assembly on page 49.



DETAIL "A" - SEAT HEIGHTS



NOTE: Rear seat bracket shown. Front seat bracket adjusts in the same way.

FIGURE 5.9 Installing the New Seat Mounting Hardware - Installing New Seat Mounting Hardware on TDX

Installing New Seat Mounting Hardware on M7I and M9I

⚠ WARNING

All seat posts *MUST* be adjusted to the same height.

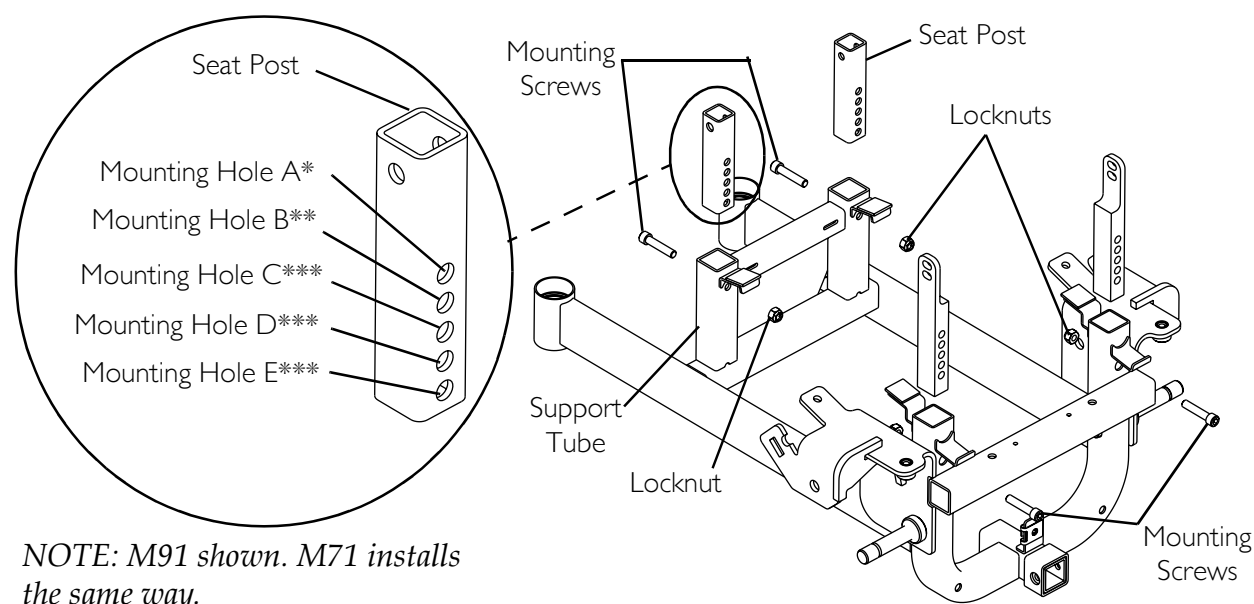
***DO NOT use Mounting Hole A. This mounting hole combination will cause interference between the front riggings and/or the seat frame and wheelchair base.**

****ALL M7I Wheelchairs and M9I Wheelchairs for users over 250 lbs *MUST* use Mounting Hole B.**

*****Mounting Holes C, D and E *MUST* only be used for M9I users under 250 lbs.**

NOTE: For this procedure, refer to FIGURE 5.10.

1. Install the seat post to desired mounting position (FIGURE 5.10).
2. Install mounting screw and locknut. Torque locknuts to 13 ft-lbs \pm 20%.
3. Repeat STEPS 1-2 for the three remaining seat posts, using the same mounting hole for each.
4. Install the tilt assembly. Refer to Installing the Seat Assembly on page 49.



NOTE: M9I shown. M7I installs the same way.

FIGURE 5.10 Installing the New Seat Mounting Hardware - Installing New Seat Mounting Hardware on M7I and M9I

Installing the Seat Assembly

NOTE: For this procedure, refer to FIGURE 5.11 on page 50.

NOTE: The stationary link attaches to the front and rear seat brackets on TDX wheelchairs and to the seat posts on M71 and M91 wheelchairs.

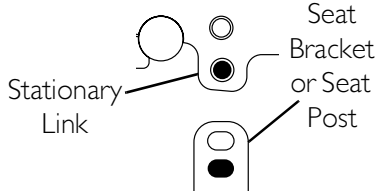
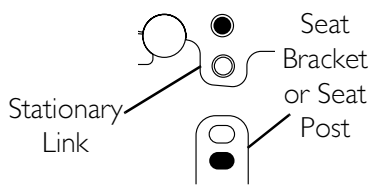
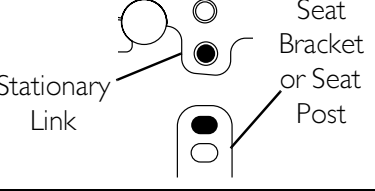
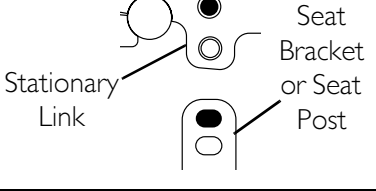
1. Align the rear stationary link mounting holes with the rear seat bracket mounting holes or the rear seat post mounting holes.
2. Secure the rear stationary link to the rear seat brackets or the rear seat posts using the two locknuts, washers* and shoulder screws. Torque locknuts to 23 ft-lbs \pm 20%.

**NOTE: Washers are present only on TDX wheelchairs.*

3. Examine the table, Seat Dump Mounting Positions on page 49, to determine the proper mounting position on the front seat brackets or seat posts for the desired seat dump.

NOTE: Seat dump is the seat angle relative to the ground when the seating system is not tilted (upright position). The seat dump can be 0°, 3° or 5°.

Seat Dump Mounting Positions

	LOWER STATIONARY LINK MOUNTING HOLE	UPPER STATIONARY LINK MOUNTING HOLE
LOWER SEAT BRACKET OR SEAT POST MOUNTING HOLE	<p>3° Seat Dump</p> 	<p>0° Seat Dump</p> 
UPPER SEAT BRACKET OR SEAT POST MOUNTING HOLE	<p>5° Seat Dump</p> 	<p>3° Seat Dump</p> 

4. Align the front stationary link mounting holes with the front seat bracket mounting holes or seat post mounting holes as noted in STEP 3.
5. Secure the front stationary link mounting holes with the front seat bracket mounting holes or seat post mounting holes using the two cap screws and washers. Torque to 13 ft-lbs \pm 20%.
6. Install the side shrouds. Refer to the wheelchair owner's manual.

7. Install the batteries. Refer to one of the following sections of the manual:

- Refer to TDX Batteries on page 173.
- Refer to M71 batteries on page 161.
- Refer to M91 Batteries on page 151.

8. Connect the cables. Refer to Connecting Cables on page 51.

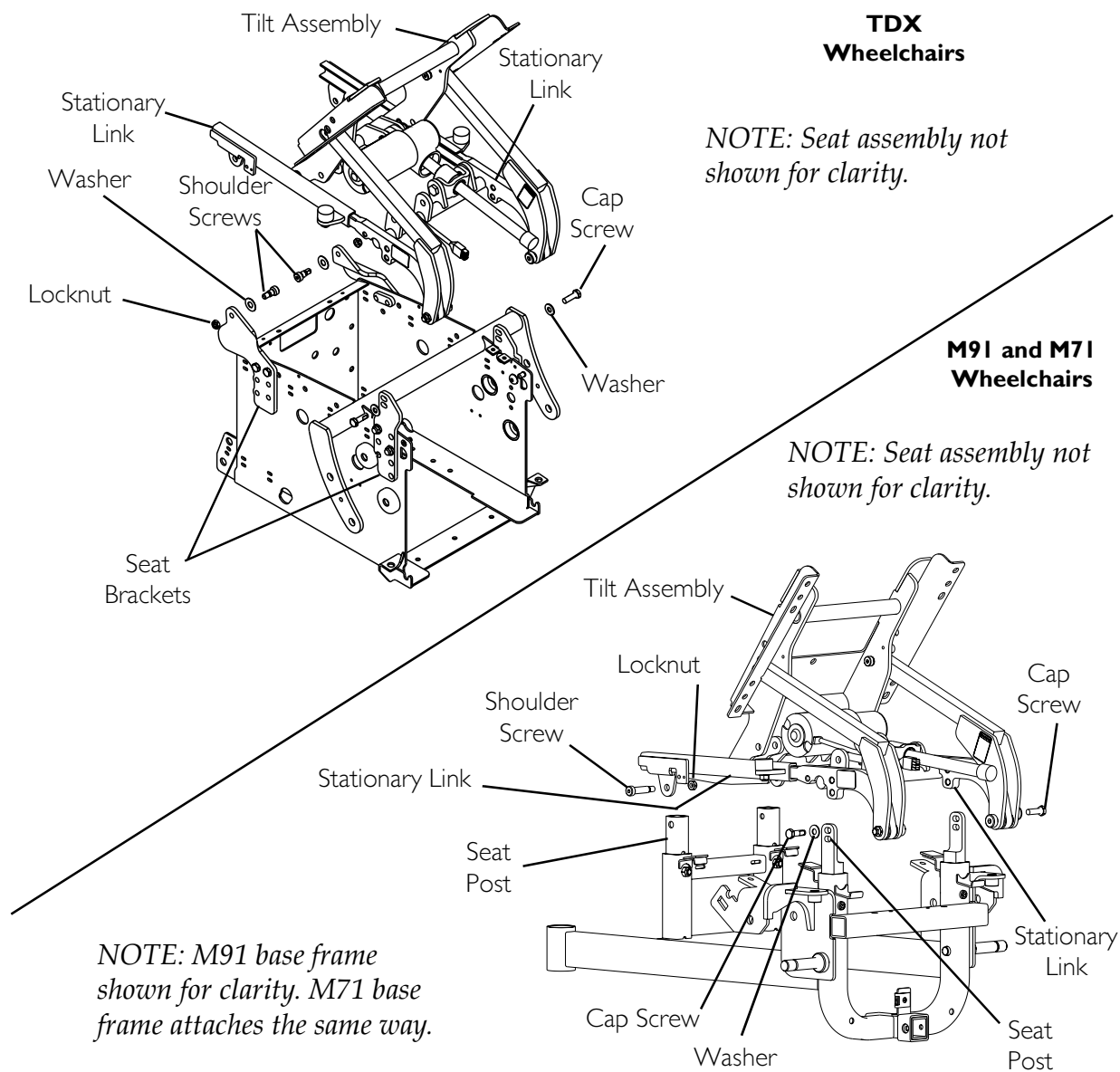


FIGURE 5.11 Installing the Seat Assembly

Connecting Cables

NOTE: For this procedure, refer to FIGURE 5.12 on page 52.

1. Connect all PTO Plus actuator connectors (2-pin Anderson) to the TRECM, TAC or TRSS actuator connectors.
2. Connect all PTO Plus sensor connectors (Molex) to the TRECM, TAC or TRSS sensor connectors.

NOTE: Systems with TAC or TRECM seating controllers have two sensors. The one on the right side of the frame is the drive lockout and the one on the left is the tilt sensor.

3. Connect the TRSS, TAC or TRECM auxiliary power connector to the power take-off connector of the MK5 Controller.
4. Connect the TRSS, TAC or TRECM to the MK5™ controller (5-pin connector).

NOTE: Wheelchairs equipped with MK5 EX controllers using TAC or TRECM require a 5-pin auxiliary cable. If it is not present, contact Invacare to order part number 1118231.

5. Connect the joystick.

⚠ WARNING

Cables MUST be secured to the wheelchair frame and/or base with tie-wraps after servicing is complete. Failure to follow the warnings and instructions below could result in injury to the users, attendants and/or bystanders and/or damage to the wheelchair.

Cables MUST be secured so there are no loops of excess cable extending away from the wheelchair. Bundle all excess cable together and secure with a tie-wrap. It may also be necessary to secure these bundles to the frame and/or base.

ALWAYS test all wheelchair functions after securing the cables to be sure cables DO NOT get pinched, crushed or pulled during operation of the wheelchair.

6. Secure the cables.
7. Perform the post-service inspection checklist. Refer to Post-Service Inspection Checklist on page 29.
8. Perform one of the following:
 - TDX Wheelchairs with TRRO - Install the TRRO non-compliance label. Refer to Installing the TRRO Non-Compliance Label on page 53.
 - Pronto Wheelchairs with TRRO or TRBKTS - Inform the wheelchair user of the change in transport ready status.

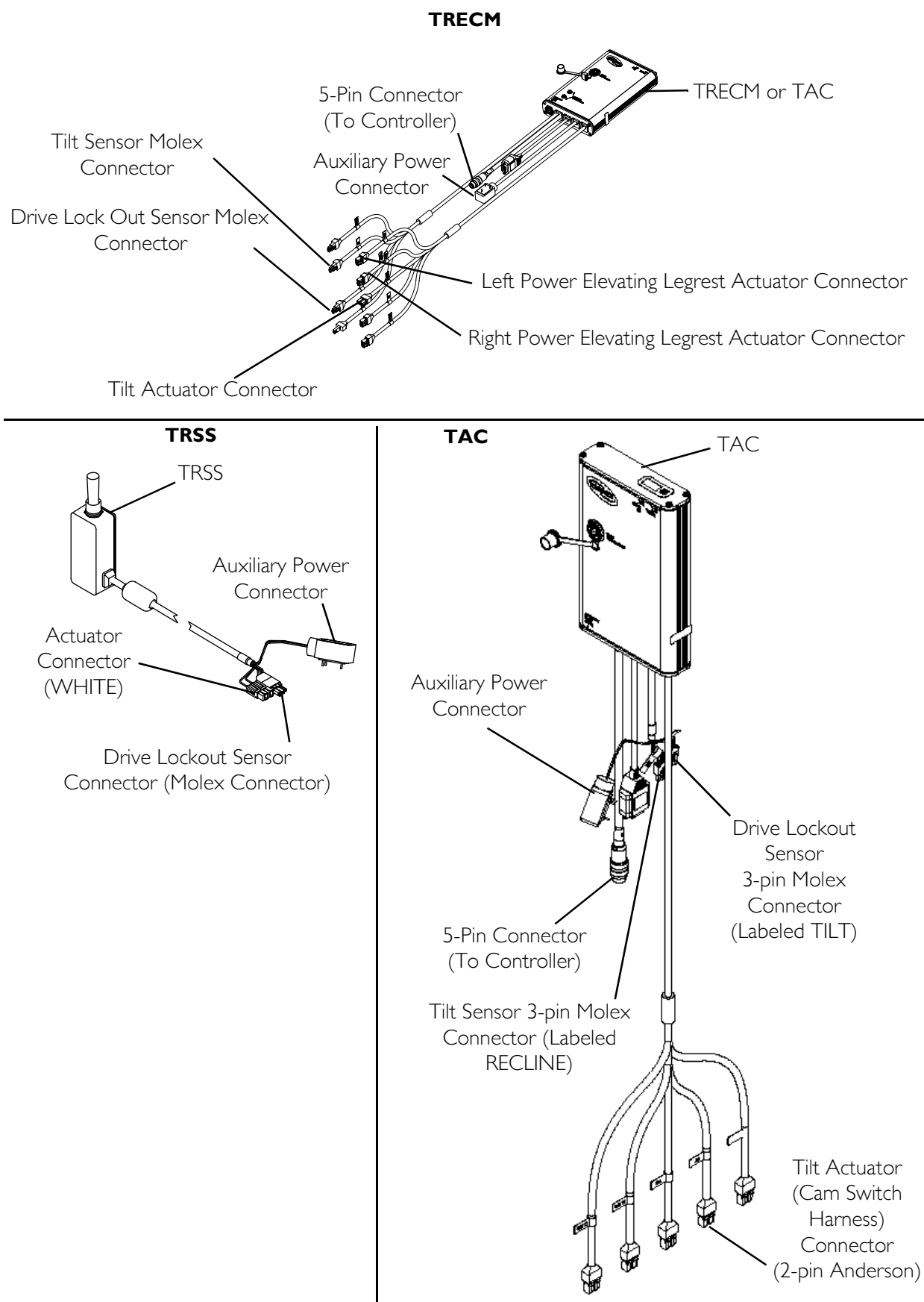


FIGURE 5.12 Connecting Cables

Installing the TRRO Non-Compliance Label

⚠ WARNING

TRRO includes four factory-installed transport brackets and a wheelchair anchored pelvic belt. **TRRO** has been crash-tested in accordance with **ANSI/RESNA WC Vol I Section 19 Frontal Impact Test** requirements for wheelchairs with a 168 lb crash dummy, which corresponds to a person with a weight of 114 to 209 lbs.

TRBKTS includes four factory-installed wheelchair transport brackets. **TRBKTS** has not been crash-tested in accordance with **WC 19**. Use these transport brackets only to secure an unoccupied wheelchair during transport.

TDX Wheelchairs with TRRO Only - The installation of this kit will void **TRRO** compliance. **DO NOT** transport an occupied wheelchair in a motor vehicle of any kind. The wheelchair may only be transported in a motor vehicle while unoccupied, and will be considered **TRBKTS**.

NOTE: For this procedure, refer to FIGURE 5.13.

1. Read and understand the warnings above.
2. Locate the TRRO compliance label between the transport brackets at the rear of the wheelchair base.
3. Install the TRRO non-compliance label to completely cover the compliance label.
4. Inform the wheelchair user and assistant of the change in transport ready status.

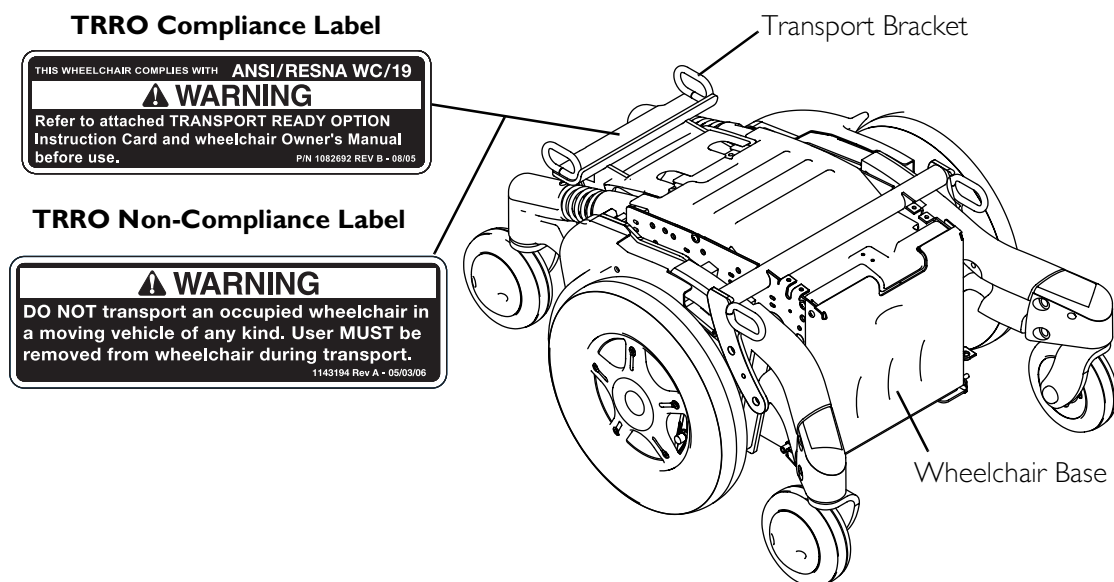


FIGURE 5.13 Installing the TRRO Non-Compliance Label

SECTION 6—CENTER MOUNT FOOTRESTS

WARNING

After any adjustments, repair or service and before use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

While the wheelchair is moving, minimum ground clearance for the front rigging is three inches. If the wheelchair is not moving, the front rigging **MUST maintain a minimum of one inch ground clearance - otherwise personal injury and damage may result.**

Before performing any maintenance, adjustments or service, always turn the wheelchair power off, otherwise injury or damage may result.

NOTE: For complete operating information on Invacare footrests, refer to the appropriate Owner's Manual listed in Reference Documents on page 13.

Removing/Installing the Center Mount Footrest

NOTE: For this procedure, refer to FIGURE 6.1 on page 55.

Removing

1. Remove the rigging pivot pin that secures the center mount footrest to the seat frame mounting bracket.
2. Hold the center mount footrest with one hand and engage the release lever with the other while simultaneously pulling the center mount footrest out of the ratchet housing.

Installing

1. Engage the release lever with one hand, hold the center mount footrest with the other, and insert the center mount footrest into the ratchet housing.
2. Reinstall the rigging pivot pin to secure the center mount footrest to the seat frame mounting bracket.

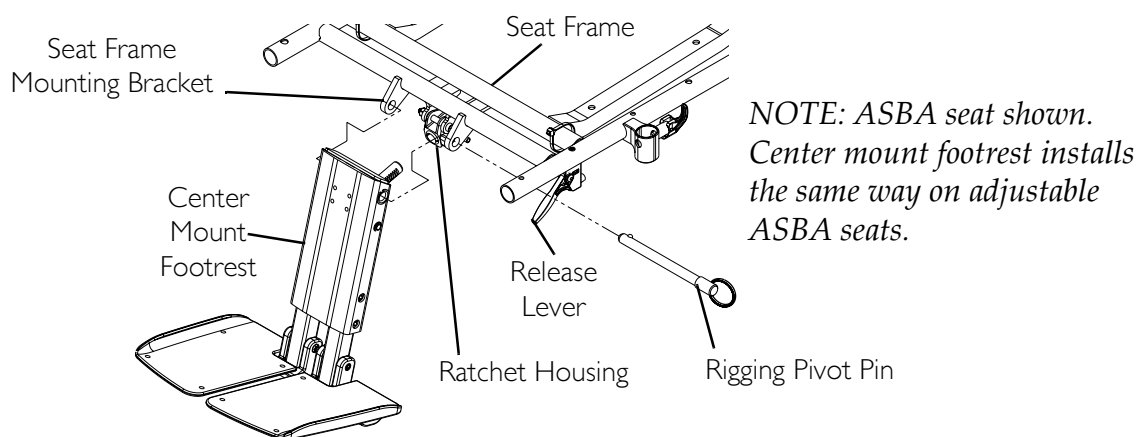


FIGURE 6.1 Removing/Installing the Center Mount Footrest

Adjusting the Height of the Center Mount Footrest

⚠ WARNING

While the wheelchair is moving, minimum ground clearance for the front rigging is three inches. If the wheelchair is not moving, the front rigging **MUST maintain a minimum of one inch ground clearance - otherwise personal injury and damage may result.**

NOTE: For this procedure, refer to FIGURE 6.2.

1. Remove the two mounting screws that secure the footrest extension tube to the extension tube housing.
2. Adjust the footrest extension tube to the desired height and align the corresponding holes to the extension tube mounting holes.
3. Reinstall the two mounting screws to secure the footrest extension tube to the extension tube housing. Securely tighten.
4. Repeat STEPS 1-3 for the other footrest extension tube.

*NOTE: ASBA seat shown.
Center mount footrest
installs the same way on
adjustable ASBA seats.*

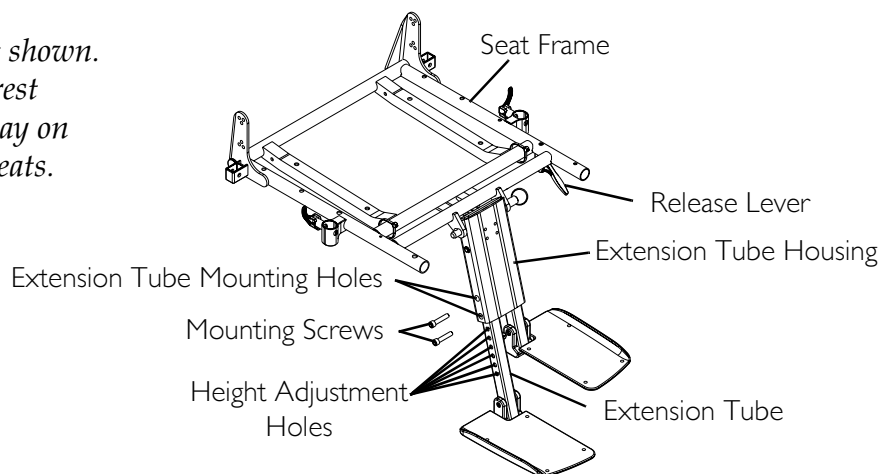


FIGURE 6.2 Adjusting the Height of the Center Mount Footrest

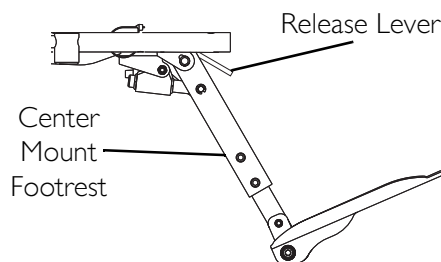
Adjusting the Angle of the Center Mount Footrest

⚠ WARNING

While the wheelchair is moving, minimum ground clearance for the front rigging is three inches. If the wheelchair is not moving, the front rigging **MUST maintain a minimum of one inch ground clearance - otherwise personal injury and damage may result.**

NOTE: For this procedure, refer to FIGURE 6.3.

1. Engage the release lever with one hand and move the center mount footrest to the desired angle with the other hand.
2. Disengage the release lever to lock the center mount footrest in the new position.



NOTE: ASBA seat shown. Center mount footrest installs the same way on adjustable ASBA seats.

FIGURE 6.3 Adjusting the Angle of the Center Mount Footrest

Adjusting the Center Mount Footplate Angle

After 2/14/07

NOTE: For this procedure, refer to FIGURE 6.4.

1. Loosen, but **DO NOT** remove, the two rear mounting screws and side mounting screw.
2. Move the footplate to the desired angle.
3. Tighten the two rear mounting screws and side mounting screw to secure the footplate in the desired position.
4. Repeat STEPS 1 and 2 for the other footplate.

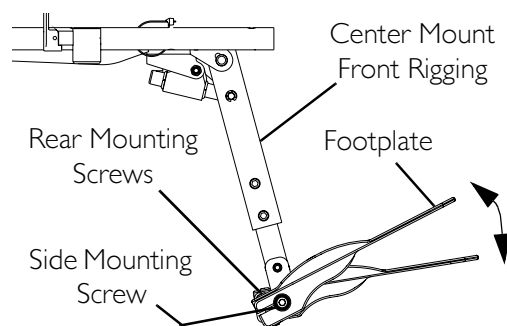


FIGURE 6.4 Adjusting the Center Mount Footplate Angle - After 2/14/07

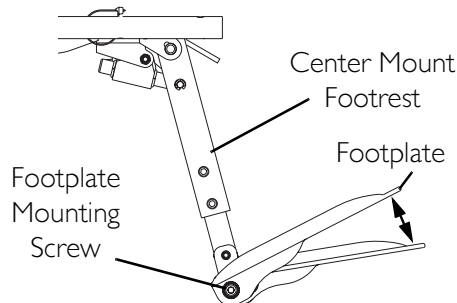
Before 2/15/07

NOTE: For this procedure, refer to FIGURE 6.5.

1. Loosen the footplate mounting screw and move the footplate to the desired angle.

NOTE: DO NOT remove the footplate mounting screw.

2. Tighten the footplate mounting screw to secure the footplate in the desired position.
3. Repeat STEPS 1 and 2 for the other footplate.



NOTE: ASBA seat shown. Center mount footrest installs the same way on adjustable ASBA seats.

FIGURE 6.5 Adjusting the Center Mount Footplate Angle - Before 2/15/07

Adjusting the Tension of the Center Mount Footplate

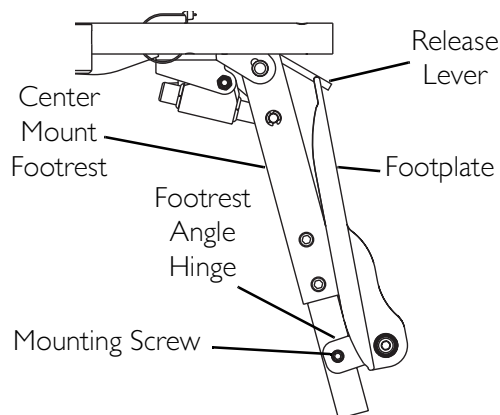
NOTE: For this procedure, refer to FIGURE 6.6.

NOTE: The tension can be adjusted to increase or decrease the rotation effort of the flip up footplates.

1. Loosen the mounting screw on the footrest angle hinge to decrease the rotation effort.

NOTE: DO NOT remove the mounting screw.

2. Tighten the mounting screw to increase the rotation effort.
3. Repeat STEPS 1 and 2 for the other footplate.



NOTE: ASBA seat shown. Center mount footrest installs the same way on adjustable ASBA seats.

FIGURE 6.6 Adjusting the Tension of the Center Mount Footplate

SECTION 7—POWER ELEVATING LEGRESTS

⚠ WARNING

After any adjustments, repair or service and before use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

While the wheelchair is moving, minimum ground clearance for the front rigging is three inches. If the wheelchair is not moving, the front rigging **MUST** maintain a minimum of one inch ground clearance - otherwise personal injury and damage may result.

Before performing any maintenance, adjustments or service, always turn the wheelchair power off, otherwise injury or damage may result.

NOTE: These procedures apply to TDX wheelchairs only.

NOTE: For complete operating information on Invacare elevating legrests, refer to the TDX Owner's Manual listed in Reference Documents on page 13.

Installing/Removing the Power Elevating Legrests

⚠ WARNING

To prevent personal injury, always verify proper positioning of legs and feet prior to use. Individual user weight may impact the rate of travel for each legrest assembly. If simultaneous operation is desired, select a speed which allows for the most uniform travel.

DO NOT insert fingers between legrest components, otherwise personal injury may occur.

CAUTION

NEVER allow items to become trapped between the legrest assemblies, otherwise damage to the power legrests may occur.

Ensure that all parts of both power legrests are clear of any obstructions before raising and lowering. Otherwise damage to the power legrests may occur.

NOTE: For this procedure, refer to FIGURE 7.1 on page 59.

Installing the Power Elevating Legrests

1. Turn power legrest to side (open footplate is perpendicular to wheelchair) and align the mounting pin on the legrest with mounting hole in the hanger assembly (Detail "A").

2. Insert the mounting pin of power legrest into the mounting hole of the hanger assembly (Detail “A”).

NOTE: Make sure the legrest sits flush on the hanger assembly.

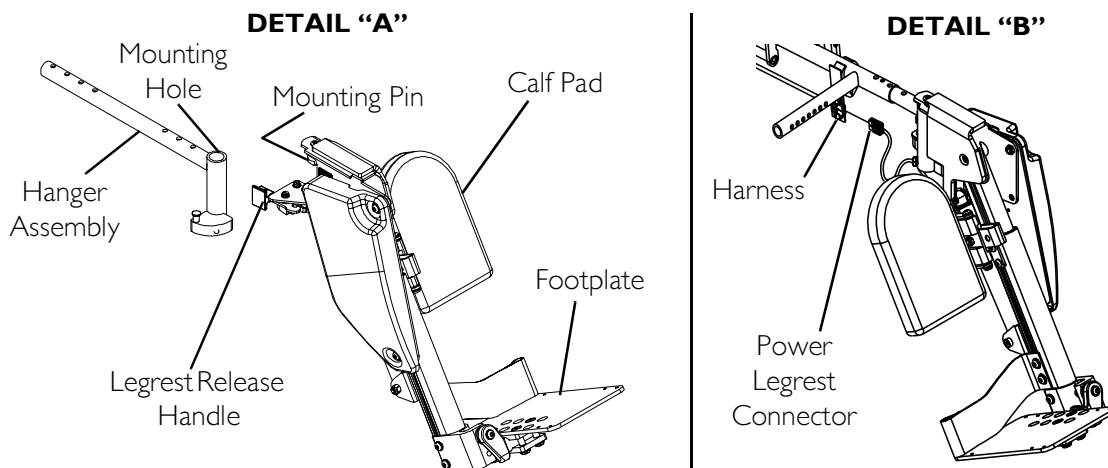
3. Rotate the power legs toward the inside of the wheelchair until it locks in place.

NOTE: The footplate will be on the inside of the wheelchair when locked in place.

4. Repeat STEPS 1-3 for the opposite legrest.
5. Connect power legrest connector to the harness (Detail “B”).
6. If necessary, adjust powered legs. Refer to Adjusting the Power Elevating Legrests below.

Removing the Power Elevating Legrests

1. Disconnect power legrests from the harness.
2. Push powered legrest release handle toward the opposite side of the wheelchair and swing legrest to the outside of the wheelchair.
3. Lift powered legrest and remove from wheelchair.
4. Repeat STEPS 1-3 for opposite power legrest.



NOTE: ASBA seat shown. Power elevating legrest installs the same way on adjustable ASBA seats.

FIGURE 7.1 Installing/Removing the Power Elevating Legrests

Adjusting the Power Elevating Legrests

Adjusting the Footplate

⚠ WARNING

DO NOT remove heel loops without providing some other adequate means of support. Otherwise personal injury may occur.

Adjusting the Footplate Height

NOTE: For this procedure, refer to FIGURE 7.2.

NOTE: The following procedure should be performed with the user in the wheelchair.

NOTE: T-nuts ride in the channels of the exterior/interior rails of the power legrests. Refer to FIGURE 7.2.

1. Loosen, but DO NOT remove, the two interior button screws that secure the footplate assembly to the T-nuts.
2. Loosen, but DO NOT remove, the two exterior button screws that secure the footplate assembly to the T-nuts.
3. Loosen, but DO NOT remove, the two button screws that secure the heel loop to the T-nuts.
4. Slide footplate assembly up or down, until desired height is achieved.
5. While holding footplate assembly in position, tighten all six button screws that were loosened in STEPS 1-3.
6. Repeat STEPS 1-5 for opposite footplate if necessary.

NOTE: If this procedure does not provide enough length, adjust the length of the power legrest. Refer to Adjusting the Length for Power Legrest on page 64.

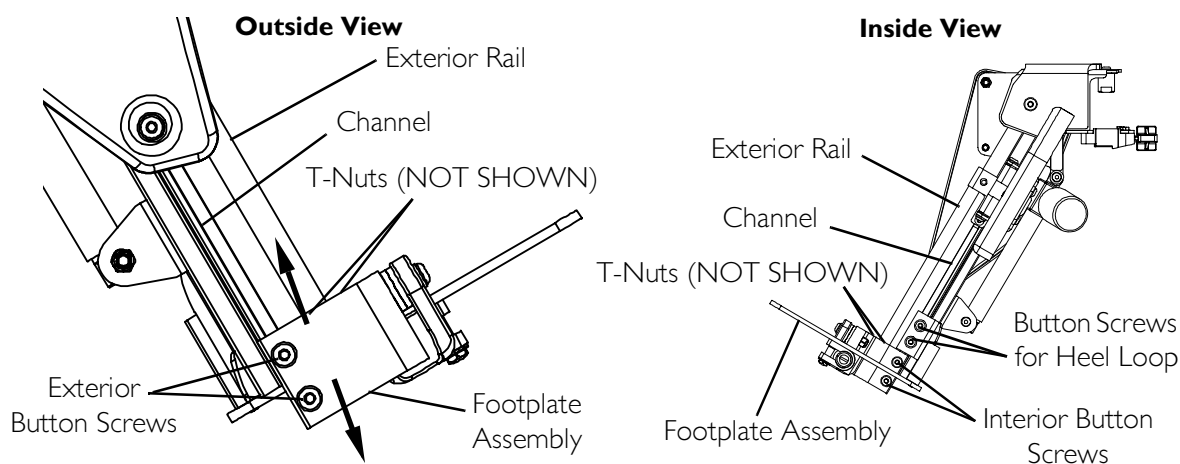


FIGURE 7.2 Adjusting the Footplate Height

Adjusting the Footplate Depth

NOTE: For this procedure, refer to FIGURE 7.3.

1. Remove the two flat head screws and the two barrel nuts that secure the footplate to the footplate clamp.
2. Reposition the footplate on the footplate clamp.
3. Align the desired depth holes on the footplate to the mounting holes on the footplate clamp.
4. Insert the barrel nuts through the bottom of the footplate clamp.
5. Install the two flat head screws through the footplate and footplate clamp.
6. Securely tighten with two barrel nuts.
7. Repeat STEPS 1-6 for opposite footplate if necessary.

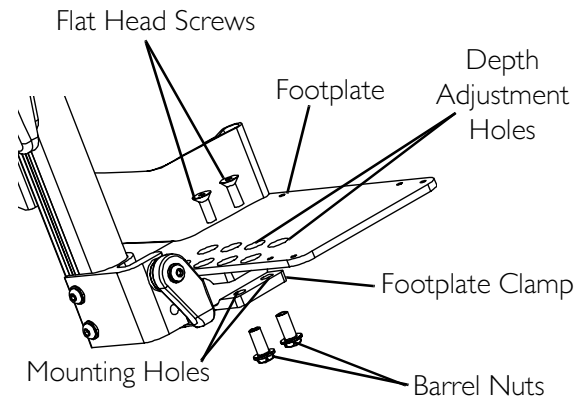


FIGURE 7.3 Adjusting the Footplate Depth

Adjusting the Footplate Angle

NOTE: For this procedure, refer to FIGURE 7.4 on page 62.

1. Loosen, but DO NOT remove, the two flat head screws and the two barrel nuts that secure the footplate to the footplate clamp. Refer to Detail "A" in FIGURE 7.4.
2. Rotate the footplate clamp on the pivot hinge until the desired angle is achieved. Refer to Detail "B" in FIGURE 7.4.
3. Securely tighten footplate to footplate clamp and hinge pivot with the two flat head screws and barrel nuts.
4. Repeat STEPS 1-3 for opposite side if necessary.
5. For additional angle adjustment, perform the following (DETAIL "C"):
 A. Loosen the set screw.
 B. Rotate footplate up or down to desired position.
 C. Retighten set screw.

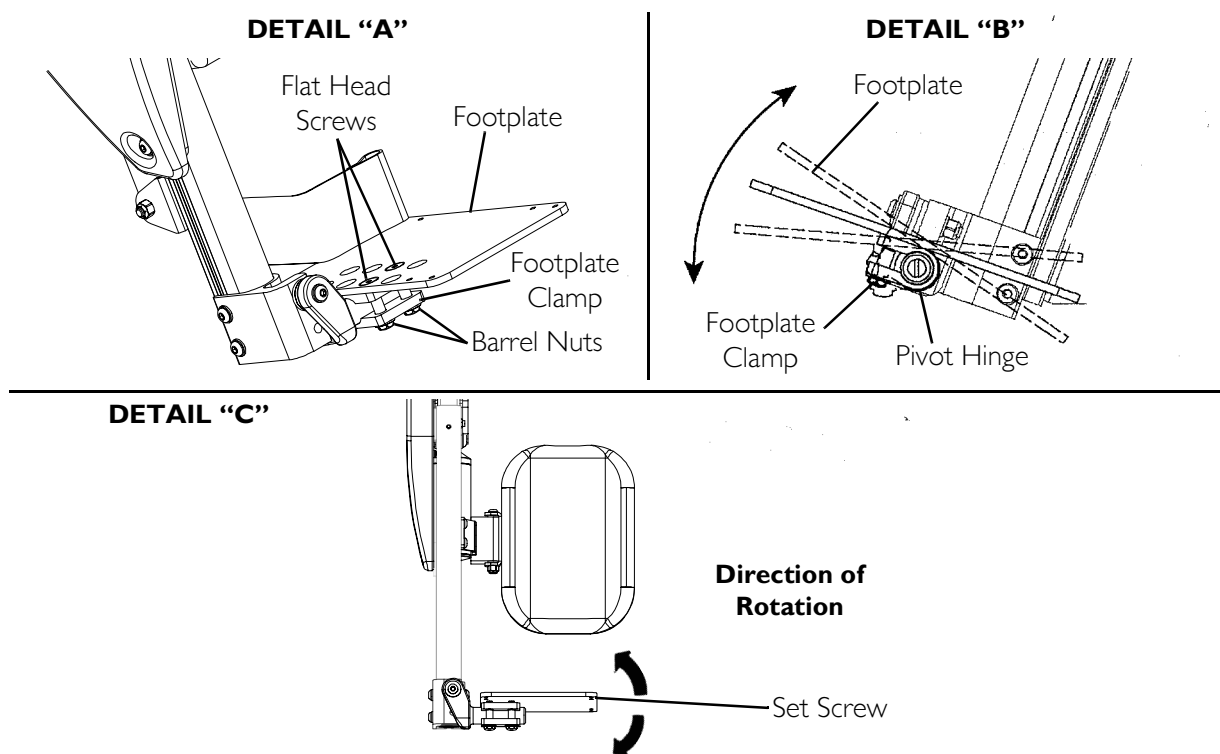


FIGURE 7.4 Adjusting the Footplate Angle

Adjusting the Calf Pad

Adjusting the Calf Pad Width

NOTE: For this procedure, refer to FIGURE 7.5.

1. Remove the two button head screws from the calf pad and calf pad bracket.
2. Reposition calf pad to calf pad bracket to desired mounting position.
3. Align button head screws to mounting holes on calf pad and calf pad bracket.
4. Install button head screws into calf pad bracket and calf pad. Securely tighten.
5. Repeat STEPS 1-4 for opposite side, if necessary.

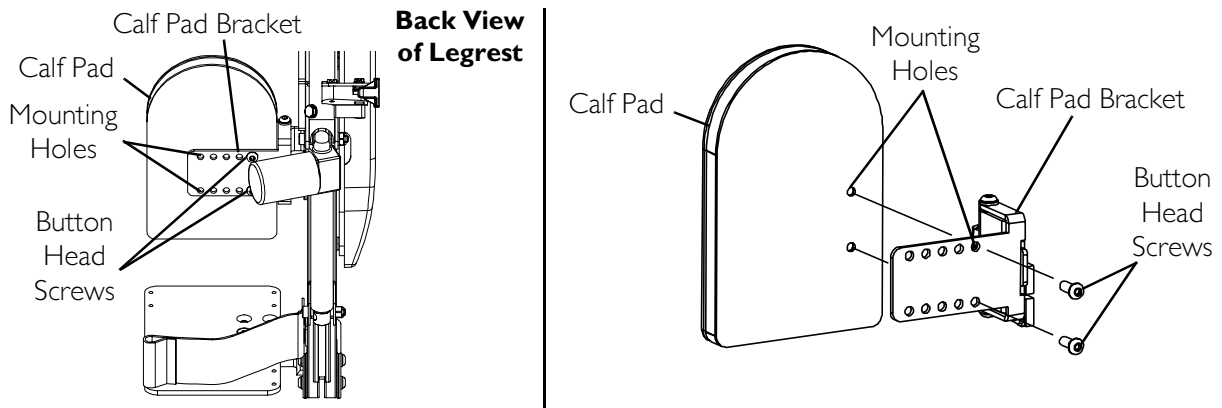
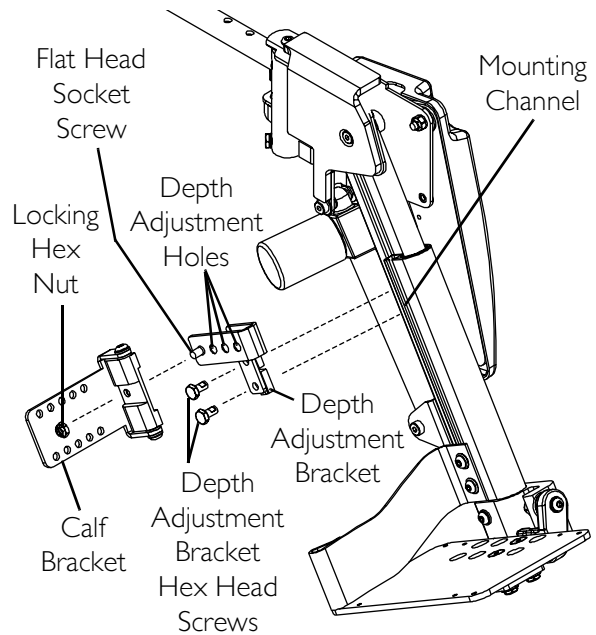


FIGURE 7.5 Adjusting the Calf Pad Width

Adjusting the Calf Pad Depth

NOTE: For this procedure, refer to FIGURE 7.6.

1. Loosen, but DO NOT remove, depth adjustment bracket hex head screws and slide calf pad assembly up and out of the mounting channel.
2. Remove the flat head socket screw, and locking hex nut that secure the calf bracket to the depth adjustment bracket.
3. Reposition the calf bracket on the depth adjustment bracket to desired position.
4. Install the flat head socket screw through the calf bracket, depth adjustment bracket and locking hex nut.
5. Tighten locking hex nut to screw until snug. DO NOT overtighten nut or calf pad will not pivot properly.



NOTE: Calf pad not shown for clarity.

FIGURE 7.6 Adjusting the Calf Pad Depth

6. Align the two T-nuts on depth adjustment bracket assembly with channel on legrest. Slide calf pad assembly to desired height. Tighten the two hex mounting screws securely.
7. Repeat STEPS 1-6 for opposite side.

Adjusting the Calf Pad Height

NOTE: For this procedure, refer to FIGURE 7.7.

1. Loosen, but DO NOT remove, the two hex head screws that secure depth adjustment bracket to the T-nuts.
2. Slide the calf pad assembly with T-nuts up or down in the channel to desired position.
3. Holding the calf pad assembly in position, tightly secure the hex screws to the T-nuts.
4. Repeat STEPS 1-3 for opposite side, if necessary.

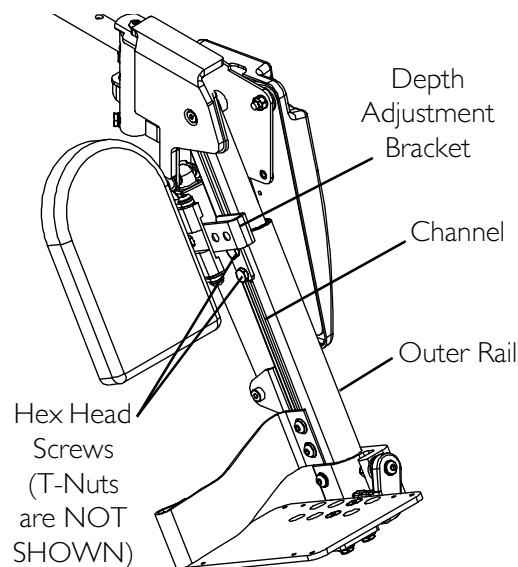


FIGURE 7.7 Adjusting the Calf Pad Height

Adjusting the Length for Power Legrest

NOTE: For this procedure, refer to FIGURE 7.8.

1. Loosen, but DO NOT remove, the length adjustment button screw (screw also secures lower end of shroud).
2. Slide footplate with outer cover up or down to desired position.
3. Securely tighten length adjustment button screw.
4. Repeat STEPS 1-3 for remaining legrest.

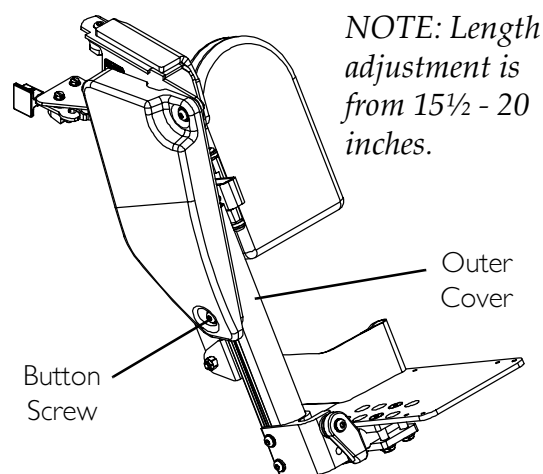


FIGURE 7.8 Adjusting the Length for Power Legrest

Removing/Installing the Power Elevating Legrest Harness

NOTE: For this procedure, refer to FIGURE 7.9 on page 66.

NOTE: This procedure is for MK₅ electronics only. The power elevating legrest harness is a part of the DLIAM for MK_{6i} electronics. If there is a problem with the harness, the DLIAM must be replaced. Refer to Removing/Installing the Dual Leg Integrated Actuator Module (DLIAM) on page 88.

Removing

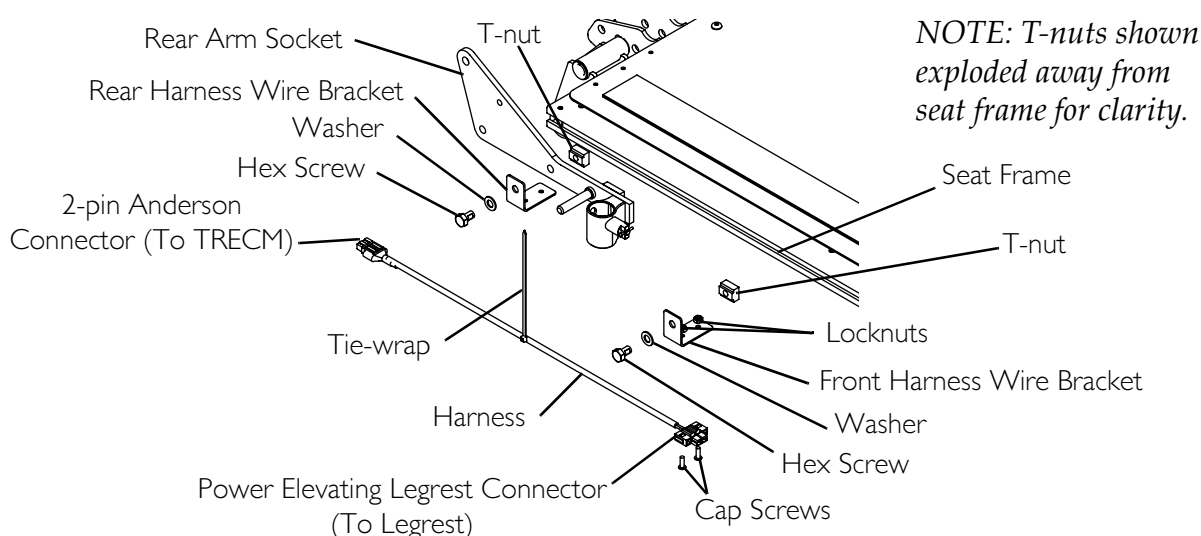
1. Unplug the power elevating legrest connector from the harness.
2. Unplug the harness from the TRECM.
3. Cut the tie-wrap securing the harness to the rear harness wire bracket.
4. Remove the two cap screws and locknuts securing the harness connector to the front harness wire bracket.

Installing

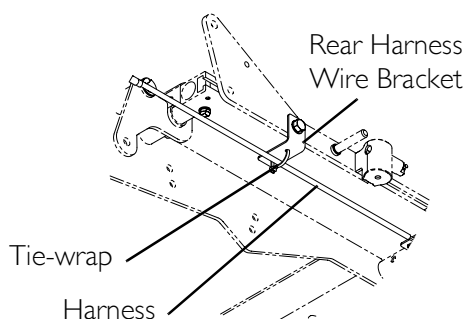
1. If power legrests were not previously installed, perform the following steps:
 - A. Remove the hex screw and washer securing the front of the rear arm socket to the seat frame.
 - B. Install the rear harness wire bracket onto the front mounting hole on the rear arm socket using the hex screw.

NOTE: The hex screw will install into the T-nut in the seat frame.

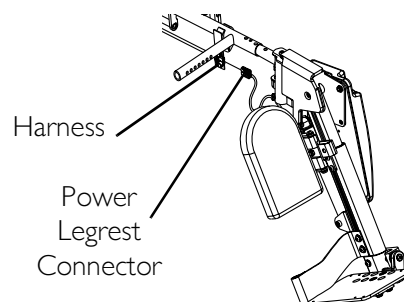
 - C. Install the hex screw through the washer and front harness wire bracket and into the T-nut in the seat frame.
 - D. Repeat STEPS A-C for the opposite side of the wheelchair.
2. Secure the power elevating legrest connector to the front harness wire bracket using the two cap screws and locknuts.
3. Tie-wrap the harness to the rear harness wire bracket (Detail “A”).
4. Plug the harness into the TRECM 3-pin Molex connector.
5. Repeat STEPS 2-4 for the opposite side of the wheelchair.
6. Install the power elevating legrests. Refer to Installing/Removing the Power Elevating Legrests on page 58.



DETAIL "A" - TIE-WRAP



DETAIL "B"



NOTE: ASBA seat shown. Power elevating legrest installs the same way on adjustable ASBA seats.

FIGURE 7.9 Removing/Installing the Power Elevating Legrest Harness

Removing/Installing the Power Elevating Legrest Actuator

NOTE: For this procedure, refer to FIGURE 7.10 on page 67.

Removing

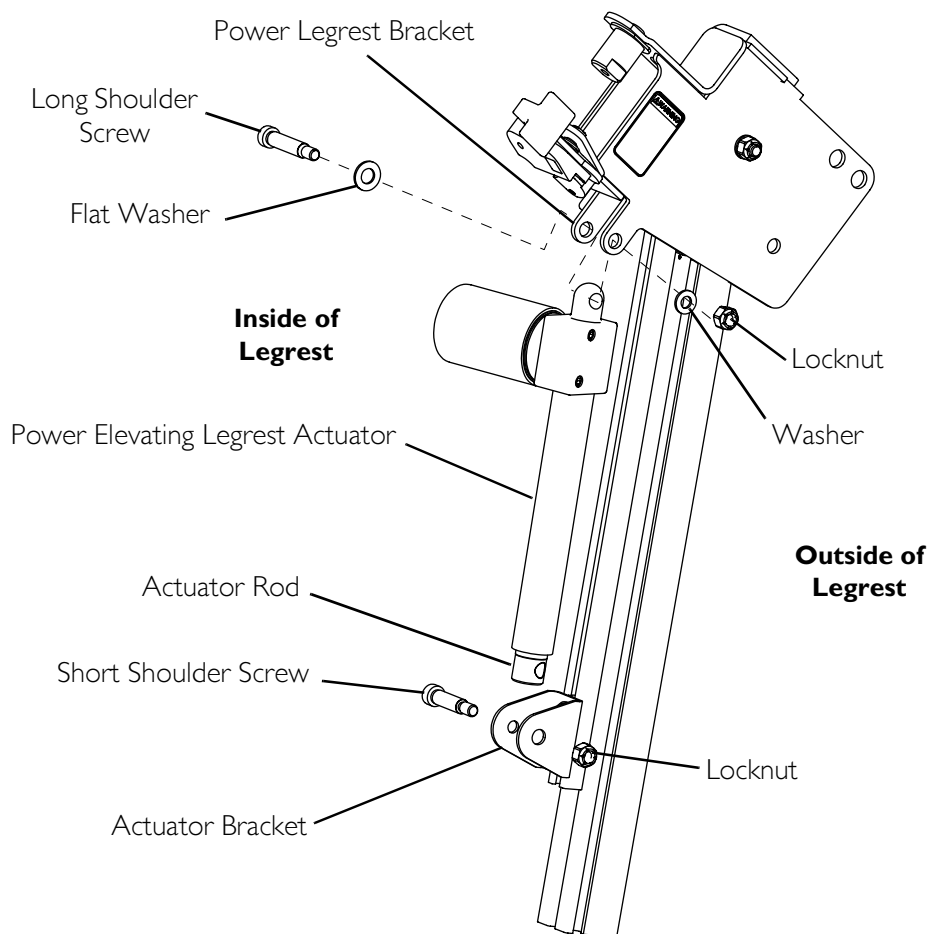
1. Remove the power elevating legrest from the wheelchair. Refer to Installing/Removing the Power Elevating Legrests on page 58.
2. Remove the long shoulder screw, flat washer, washer and locknut securing the top of the power elevating legrest actuator to the power legrest bracket.
3. Remove the short shoulder screw and locknut securing the actuator rod to the actuator bracket.
4. Remove the power elevating legrest actuator from the legrest.

Installing

1. Unscrew the actuator rod ½ turn.
2. Secure the actuator rod to the actuator bracket using the short shoulder screw and locknut.
3. Secure the top of the power elevating legrest actuator to the power legrest bracket using the long shoulder screw, flat washer, washer and locknut.

NOTE: The shoulder screw should be on the inside of the legrest and the locknut should be toward the outside of the legrest.

4. Install the power elevating legrest. Refer to Installing/Removing the Power Elevating Legrests on page 58.



NOTE: Rear of right power elevating legrest shown. Left legrest actuator mounts in the same way.

FIGURE 7.10 Removing/Installing the Power Elevating Legrest Actuator

SECTION 8—BACK

WARNING

After any adjustments, repair or service and before use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

Before performing any maintenance, adjustments or service, always turn the wheel-chair power off, otherwise injury or damage may result.

Removing/Installing/Adjusting the Curved Back Pan

NOTE: For this procedure, refer to FIGURE 8.1 on page 70.

NOTE: The following tools and items are required to perform this procedure:

- 7/16-inch Socket with Ratchet
- 9/64-inch Allen Wrench

Removing the Curved Back Pan

1. Remove back cushion.
2. Remove the four locknuts that secure the curved back pan to the back canes.
3. Remove the curved back pan from the upper mounting brackets.

Installing the Curved Back Pan

1. If the fastening strips and upper curved back pan mounting screws have been removed from the curved back pan, and/or the upper mounting brackets have been removed from the back canes, perform the following steps:
 - A. Install two curved back pan mounting screws through the front of the curved back pan.
 - B. Position one upper mounting bracket onto the back cane.
 - C. Install the small mounting screw to secure the upper mounting bracket to the back cane.
 - D. Repeat STEPS B and C for the remaining back cane.
2. Install the two spacers onto the upper curved back pan mounting screws.

NOTE: The spacer channel should face the rear of the wheelchair.

3. Insert the two upper curved back pan mounting screws through the upper mounting brackets.
4. Rotate the spacers so the upper mounting brackets fit flush into the spacer channels.

NOTE: The spacer channels should be oriented toward the inside of the wheelchair.

5. Install two locknuts onto the curved back pan mounting screws to secure the curved back pan to the upper mounting brackets.
6. Install one spacer onto one lower curved back pan mounting screw.
7. Position one lower mounting bracket onto the back cane on the same side used in STEP 5.
8. Insert the curved back pan mounting screw through the lower mounting bracket.
9. Install one locknut onto the curved back pan mounting screw to secure the curved back pan to the lower mounting bracket.
10. Repeat STEPS 5 - 8 for the opposite side.
11. Tighten all locknuts.

NOTE: If any locknuts cannot be tightened properly, perform the following steps:

- A. Remove the fastening strip from the curved back pan.*
- B. Use an allen wrench to hold the curved back pan mounting screw while tightening the locknut.*
- C. Install the fastening strip over the curved back pan mounting screws.*

12. Install the back cushion.

Adjusting the Curved Back Pan Height

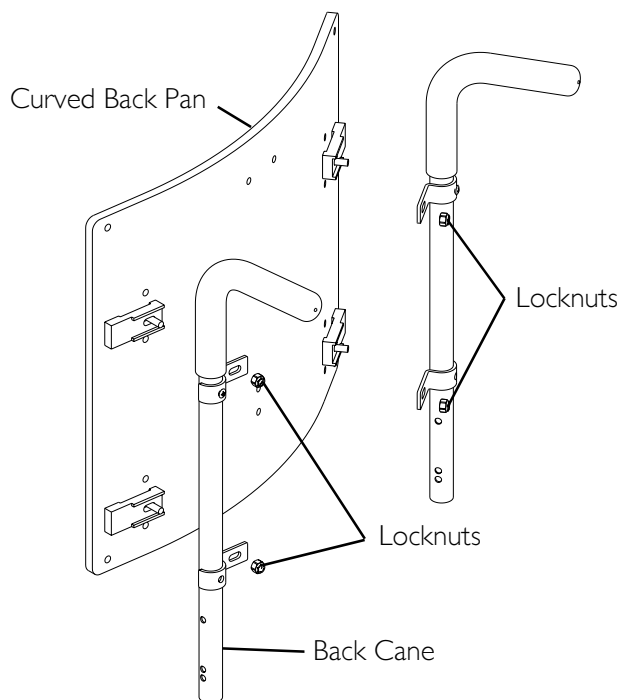
NOTE: The curved back pan can be adjusted to three positions in one inch increments.

1. Remove the curved back pan. Refer to Removing the Curved Back Pan on page 68.
2. Remove the two fastening strips from the front of the curved back pan.

NOTE: Set the fastening strips aside for reinstallation.

3. Install the curved back pan in the desired mounting position. Refer to Installing the Curved Back Pan on page 68.

DETAIL “A” - REMOVING THE CURVED BACK PAN



**DETAIL “B” - INSTALLING THE CURVED BACK PAN /
ADJUSTING CURVED BACK PAN HEIGHT**

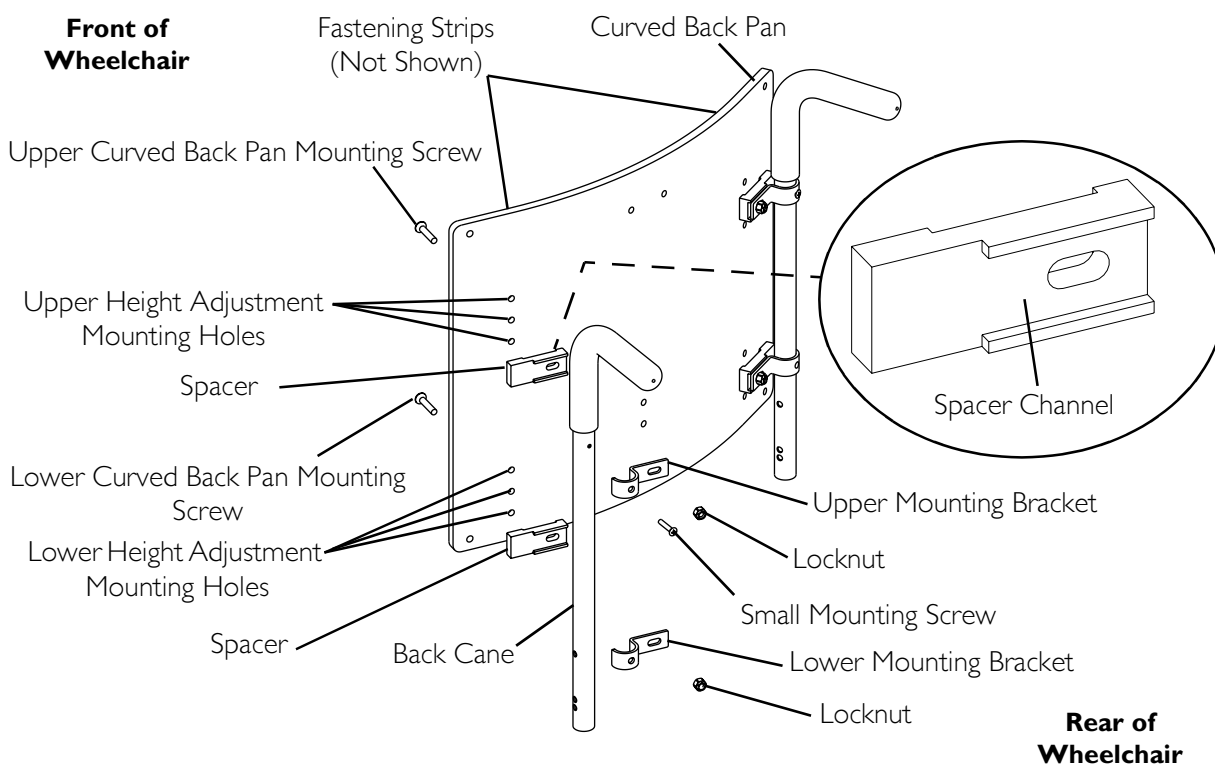


FIGURE 8.1 Removing/Installing/Adjusting the Curved Back Pan

Removing/Installing the Contoura Back

NOTE: For this procedure, refer to FIGURE 8.2 on page 72.

Removing the Contoura Back

1. Remove back cushion.
2. Remove the two mounting screws that secure the lower front mounting brackets to the back canes.
3. Remove the four socket screws, washers and locknuts (not shown) that secure the four front and rear mounting brackets.
4. Remove the Contoura back and hardware from the back canes.

Installing the Contoura Back

1. Position the front mounting brackets against the back canes.
2. Secure the lower front mounting brackets to the back canes using the two mounting screws. Torque to 32 in-lbs \pm 20%.
3. Insert the tab of the rear mounting bracket into the slot in the front mounting bracket.
4. Secure the four rear mounting brackets to the four front mounting brackets using the four socket screws, washers and locknuts (not shown). Torque to 75 in-lbs \pm 20%.
5. If necessary, tighten the socket screws and locknuts securing the front mounting brackets to the slot in the Contoura back. Torque to 75 in-lbs \pm 20%.

Removing the Mounting Hardware from the Contoura Back

1. Remove the four socket screws, eight washers and four locknuts that secure the front mounting bracket to the Contoura back.
2. Remove the hardware from the back.

Installing the Mounting Hardware onto the Contoura Back

1. Secure two of the front mounting brackets to the mounting holes in the Contoura back using two socket screws, four washers and two locknuts. Torque to 75 in-lbs \pm 20%.
2. Loosely attach the remaining two front mounting brackets to the slots in the Contoura back using two socket screws, four washers and two locknuts.

NOTE: The two socket screws and locknuts will be tightened when the Contoura back is installed onto the back canes.

3. Install the Contoura back. Refer to Installing the Contoura Back on page 71.

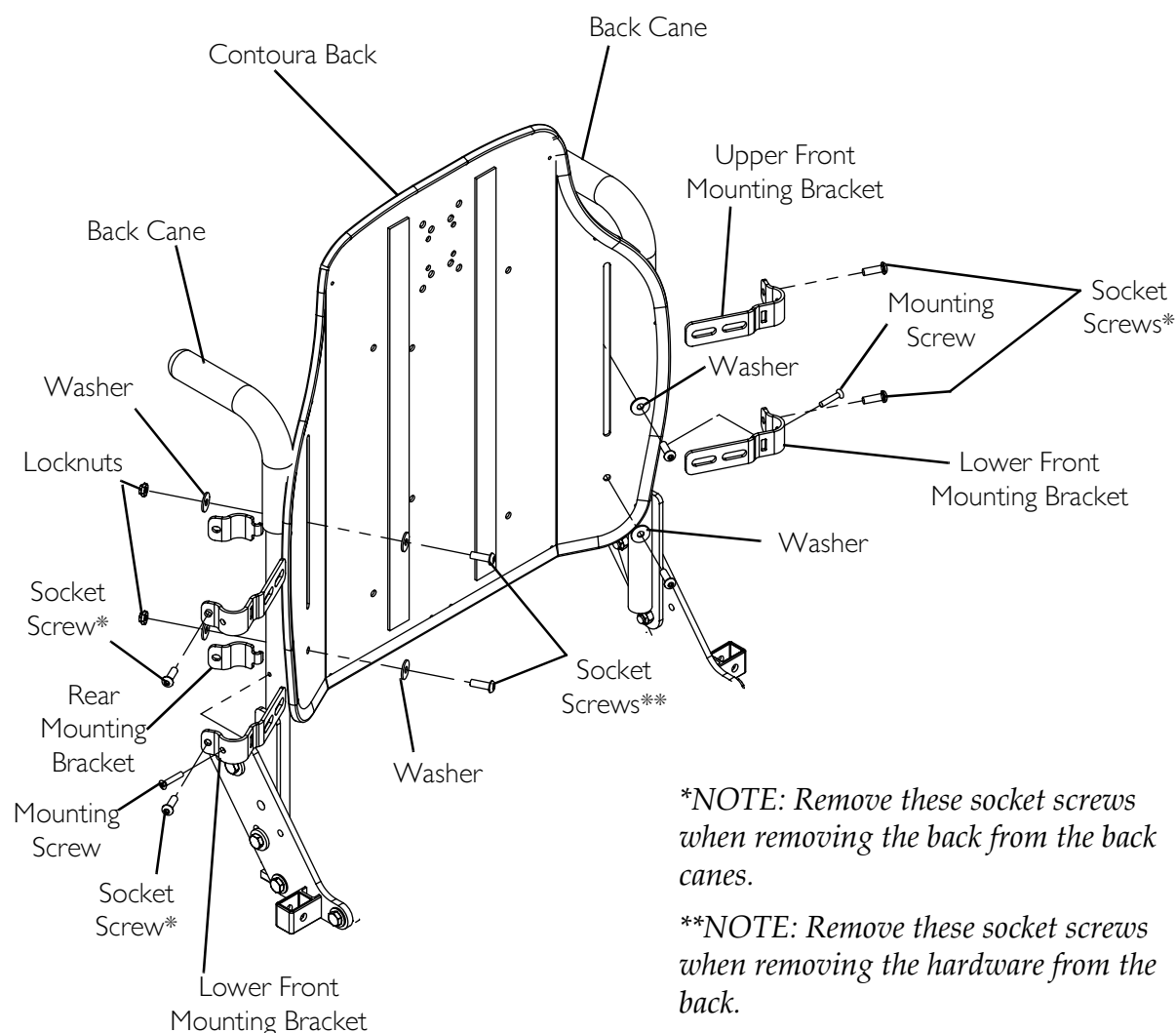


FIGURE 8.2 Removing/Installing the Contoura Back

Adjusting the Back Width

A new back pan is required when the back width is adjusted. Back width must be adjusted with seat width. Refer to [Adjusting the Seat Width](#) on page 93.

Contoura Backs Only - Seat and back widths are restricted to 16, 18, 20, 22 or 24 inches.

Adjusting the Back Angle

ASBA Seats

NOTE: For this procedure, refer to FIGURE 8.3 on page 73.

1. Remove the armrests from the wheelchair.
2. Remove the mounting screw, washer, coved washer and locknut from the top mounting hole of back angle plate and back cane.

NOTE: To avoid losing the insert in each back cane, thread the mounting screw through the cane from the inside of wheelchair to hold the insert in place.

3. Remove the mounting screw, washer, coved washer and locknut from the bottom mounting hole of the back angle plate and back cane.
4. Reposition the back canes into the correct mounting holes of the back angle plate to obtain a back angle between 80° and 100° in 5° increments.
5. Starting with the bottom mounting hole, use the two mounting screws, washers, coved washers and locknuts to secure the back cane with insert to the back angle plate.
6. Torque mounting screws to 75 in-lbs \pm 20%.
7. Reinstall the flip back armrests onto the wheelchair.

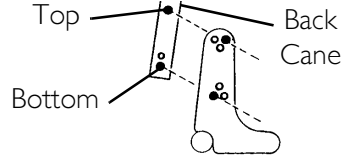
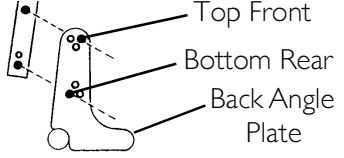
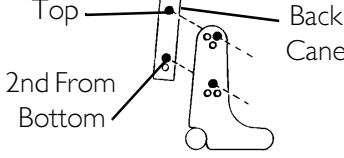
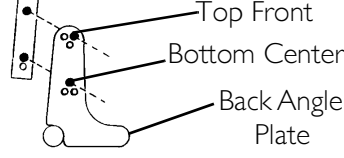
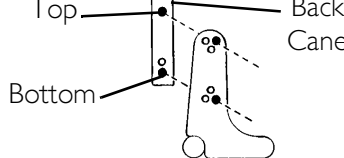
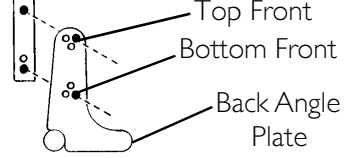
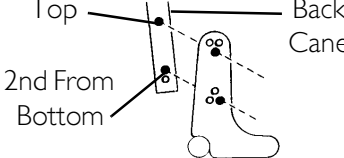
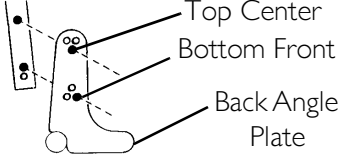
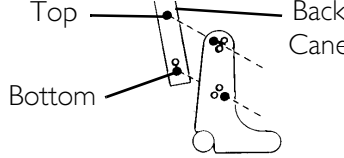
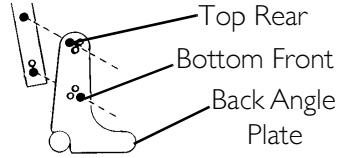
ANGLE	BACK CANE MOUNTING HOLE	BACK ANGLE PLATE HOLE
80°		
85°		
90°		
95°		
100°		

FIGURE 8.3 Adjusting the Back Angle - ASBA Seats

Adjustable ASBA Seats

NOTE: For this procedure, refer to FIGURE 8.4 on page 74.

1. Loosen, but DO NOT remove, the two lower hex screws securing the cane brackets to the back canes.

2. Remove the two upper hex screws, washers and locknuts securing the cane brackets to the back canes.
3. Align the upper mounting holes in the back canes with the desired mounting holes in the cane brackets (Detail "A" of FIGURE 8.4).
4. Install the two upper hex screws, washers and locknuts to secure the cane brackets to the back canes.
5. Torque the locknuts on upper and lower hex screws to 13 ft-lbs.

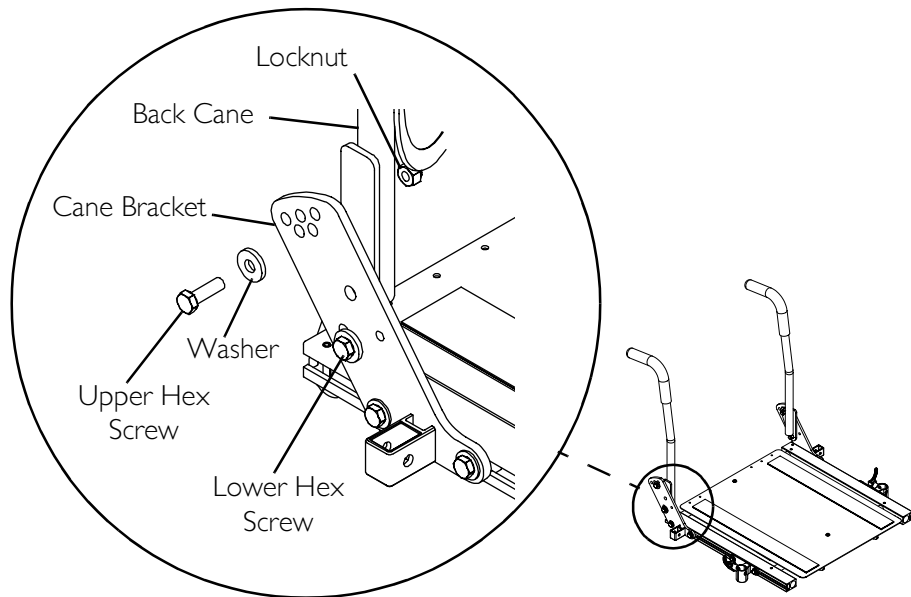
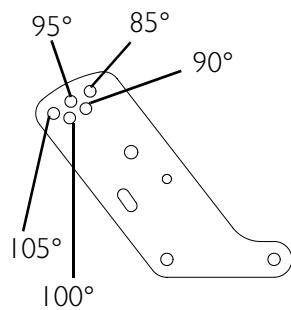
**DETAIL "A" - CANE
BRACKET
MOUNTING HOLES**

FIGURE 8.4 Adjusting the Back Angle - Adjustable ASBA Seats

Adjusting the Back Height

Curved Backs - The back canes must be replaced to adjust the back height. Refer to [Removing/Installing the Back Canes](#) on page 75.

Contoura Backs - There is no height adjustment available for wheelchairs with Contoura backs.

Removing/Installing the Back Canes

ASBA Seats

NOTE: For this procedure, refer to FIGURE 8.5 on page 76.

NOTE: The following tools and items are required to perform this procedure:

- 7/16-inch Socket with Ratchet
 - 7/16-inch Box Wrench
 - Screwdriver
 - Wire Cutters
 - Tie-wraps
1. Remove seat cushion.
 2. Remove armrest. Refer to the wheelchair owner's manual.
 3. Perform one of the following:
 - Wheelchairs with a Back Pan - Perform the following steps:
 - i. Remove the back pan from the back canes. Refer to Removing the Curved Back Pan on page 68.
 - ii. Remove the two fastening strips from the back pan.
 - iii. Remove the four back pan mounting screws from the back pan.
 - iv. Remove the two small mounting screws securing the upper mounting brackets to the back canes.
 - Wheelchairs with a Seating System - Remove the seating system from the back canes. Refer to the seating system owner's manual.
 4. To ensure the proper back angle is restored during reinstallation, note the back cane mounting positions used on seat frame brackets.
 5. Remove the four hex screws, washers, coved washers, and locknuts that secure the existing back canes to the seat frame.

NOTE: Existing hardware and inserts will be reused.

6. Remove the back canes from the wheelchair.

NOTE: Back insert should automatically come out of the back cane.

7. Slide the back insert into the bottom of the new/existing back canes.
8. Line up the mounting holes of the back insert with the mounting holes in the back canes and partially insert one hex screw to maintain location of back insert.

⚠ WARNING

The back canes *MUST* be fastened securely to the seat frame before using the wheelchair. Torque to 75 in-lbs ± 20%.

9. Mount back canes to the seat frame in the location noted from STEP 4. Secure the back canes to the seat frame with the existing four hex screws, washers, coved washers, and locknuts. Torque to 75 in-lbs \pm 20%.
10. Perform one of the following:
 - Wheelchairs with a Back Pan - Install the back pan. Refer to Installing the Curved Back Pan on page 68.
 - Wheelchairs with a Seating System - Install the seating system. Refer to the seating system owner's manual.
11. Install the seat cushion.
12. Install the armrest. Refer to the wheelchair owner's manual.

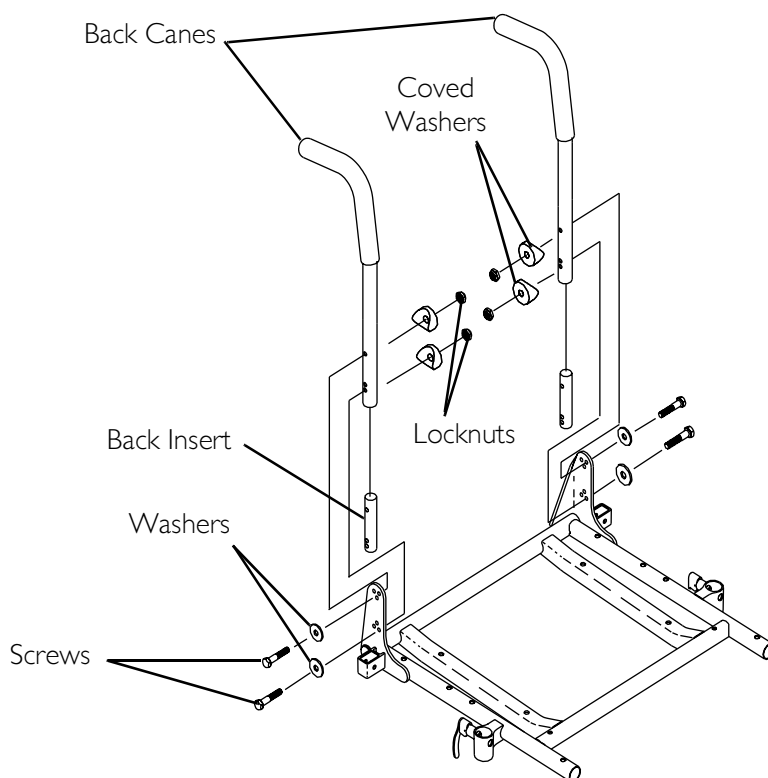


FIGURE 8.5 Removing/Installing the Back Canes - ASBA Seats

Adjustable ASBA Seats

NOTE: For this procedure, refer to FIGURE 8.6 on page 77.

NOTE: Existing hardware will be reused.

NOTE: Take note of position and orientation of mounting hardware for reinstallation.

Removing

1. Remove the back pan. Refer to Removing the Curved Back Pan on page 68.
2. Remove armrest from the wheelchair. Refer to the wheelchair owner's manual.

NOTE: Note the back angle before disassembly for proper reinstallation.

3. For proper installation, note the mounting position of the upper hex screw securing the cane bracket to the back cane.
4. Remove the upper hex screw, washer and locknut securing the cane bracket to the back cane.
5. Remove the lower hex screw, washer and locknut securing the cane bracket to the back cane.
6. Remove the back cane from the wheelchair.
7. Repeat STEPS 2 - 6 for the opposite back cane.

Installing

NOTE: If replacing back canes, discard existing back canes and perform this procedure using new back canes.

1. Install the lower hex screw, washer and locknut through the slot in the cane bracket to secure the cane bracket to the back cane.

NOTE: The cane bracket should be positioned as shown in FIGURE 8.6.

2. Install the upper hex screw, washer and locknut through one of the following:
 - Using the Same Back Angle - the mounting hole noted in STEP 3 of Removing on page 76.
 - Changing the Back Angle - the mounting hole determined in Adjusting the Back Angle on page 72.
3. Torque both locknuts to 13 ft-lbs.
4. Repeat STEPS 1 - 3 for the opposite back cane.
5. Reinstall the flip back armrest onto the wheelchair. Refer to the wheelchair owner's manual.
6. Install the back pan. Refer to Installing the Curved Back Pan on page 68.

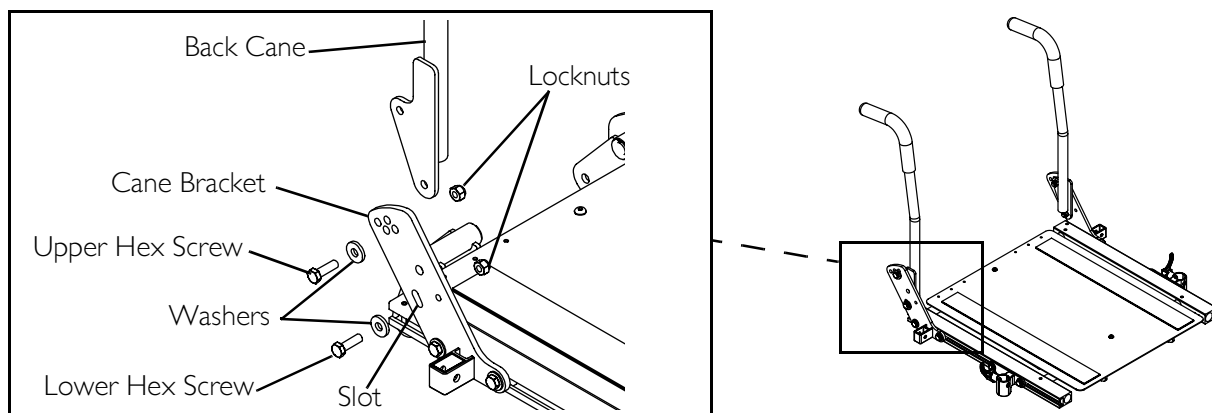


FIGURE 8.6 Removing/Installing the Back Canes - Adjustable ASBA Seats

Removing/Installing the Spreader Bar

NOTE: For this procedure, refer to FIGURE 8.7.

NOTE: This procedure only applies to BPO (Back Post Only) systems.

Removing

1. Remove the six socket screws securing the half clamps and the push bar to the back canes.
2. Remove the push bar from the back canes.

Installing

1. Position one pair of half clamps around one of the push bar mounting tubes.

NOTE: The threaded half clamp should be towards the rear of the wheelchair.

2. Position the half clamps with the push bar onto one back cane.

NOTE: The push bar should be oriented with the clevis pointing down.

NOTE: The half clamps should be positioned between the mounting holes in the back cane.

3. Loosely install the three socket screws to secure the half clamps to the back cane.
4. Repeat STEPS 1 - 3 for the opposite side of the push bar.
5. Torque the six socket screws to 75 in-lbs \pm 20%.

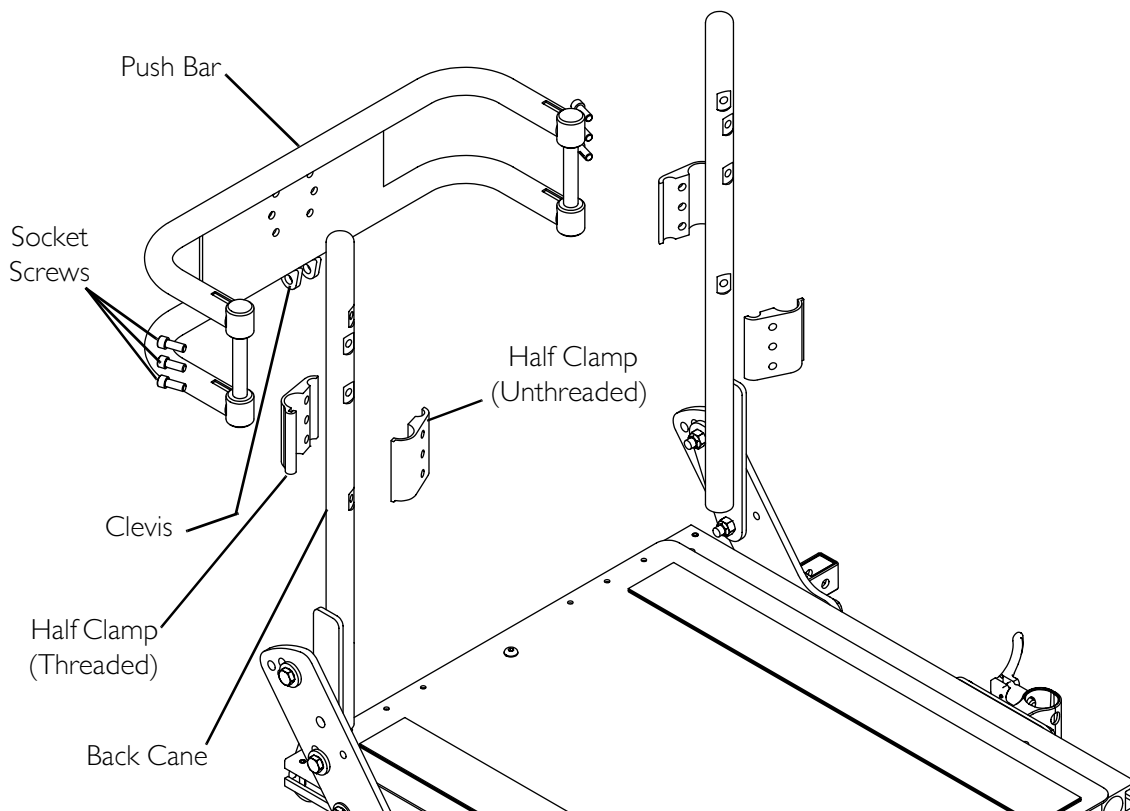


FIGURE 8.7 Removing/Installing the Spreader Bar

Removing/Installing/Adjusting Tarsys® Lateral Supports

Removing/Installing

NOTE: For this procedure, refer to FIGURE 8.8.

1. Remove the three hex screws securing the half clamps to the back canes.
2. Remove the two socket screws securing the bracket (with lateral support attached) to the half clamp.
3. Position the half clamps on the back cane.

NOTE: Ensure the half clamp with the threaded holes is towards the front of the wheelchair.

4. Secure the half clamps to the back canes using the three hex screws.
5. Secure the bracket (with lateral support attached) to the half clamp with threaded holes using two socket screws.

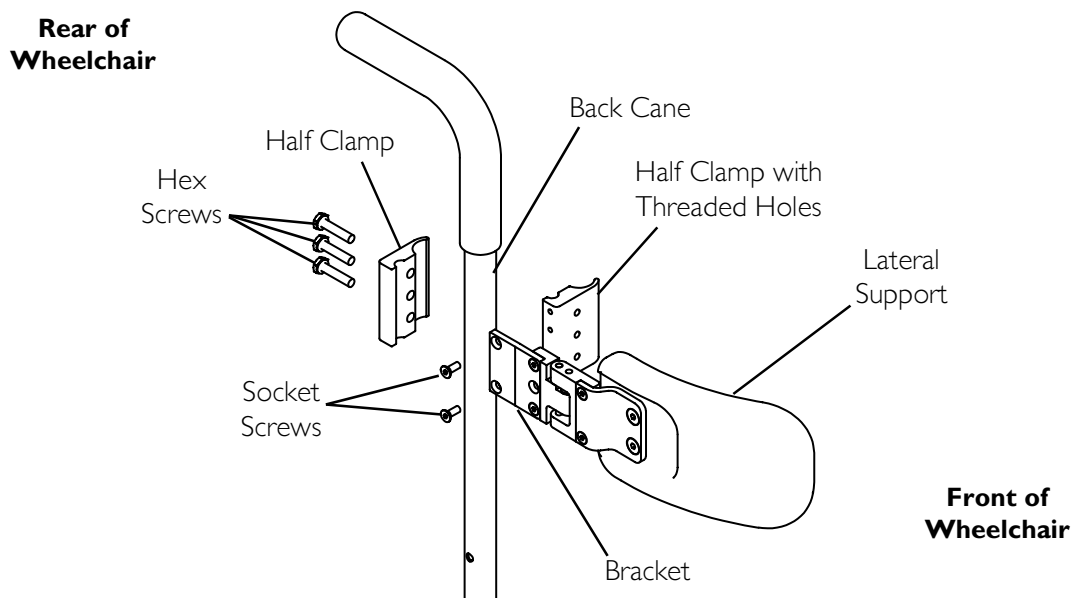


FIGURE 8.8 Removing/Installing/Adjusting Tarsys® Lateral Supports

Adjusting Lateral Height

NOTE: For this procedure, refer to FIGURE 8.9 on page 80.

1. Loosen, but DO NOT remove, the three socket screws securing the half clamps to the back cane.
2. Adjust the height of the lateral support.
3. Tighten the three socket screws to secure the half clamps to the back cane.

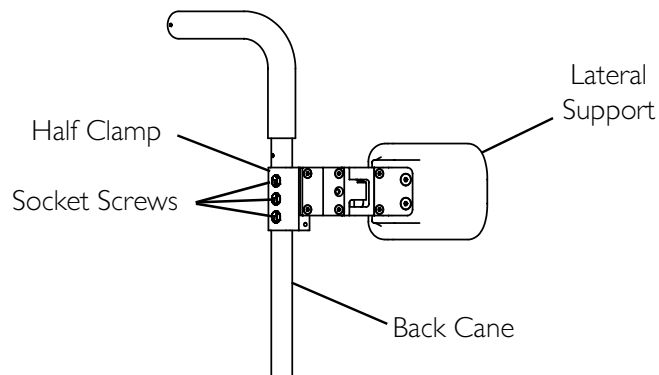


FIGURE 8.9 Adjusting Lateral Height

Adjusting Lateral Depth

NOTE: For this procedure, refer to FIGURE 8.10.

1. Remove the two flat screws that secure the lateral support pad to the bracket.
2. Reposition the bracket to the other set of mounting holes in the lateral support.
3. Install the two flat screws to secure the lateral support pad to the bracket.

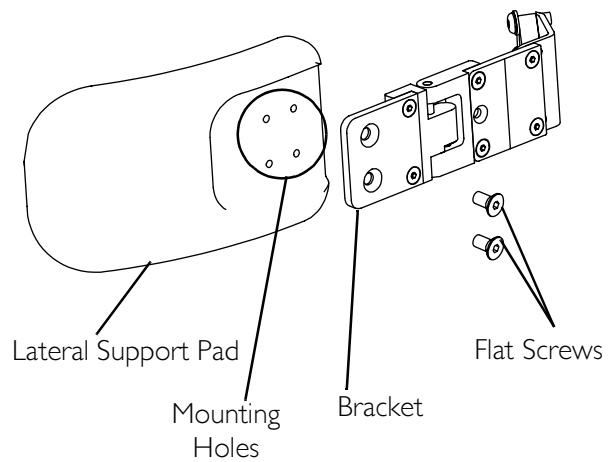


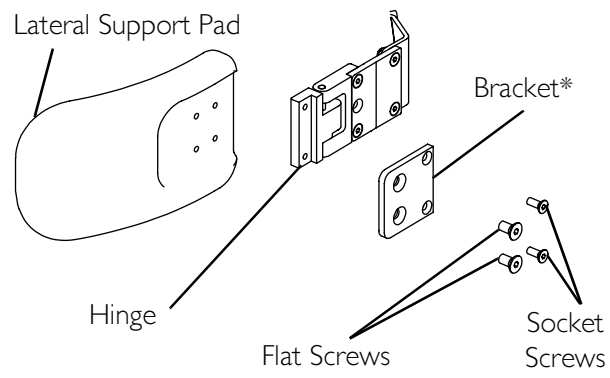
FIGURE 8.10 Adjusting Lateral Depth

Adjusting Lateral Width

NOTE: For this procedure, refer to FIGURE 8.11 on page 81.

NOTE: To adjust lateral width, a different size bracket must be installed.

1. Note the depth mounting position of the lateral support pad.
2. Remove the two flat screws that secure the lateral support pad to the existing bracket.
3. Remove the two socket screws that secure the existing bracket to the hinge.
4. Align the mounting holes in the new bracket with the mounting holes in the hinge.
5. Use the two socket screws to secure the new bracket to the hinge.
6. Secure the lateral support pad to the new bracket with the two flat screws.



**NOTE: Only one size bracket is shown for clarity.*

FIGURE 8.11 Adjusting Lateral Width

SECTION 9—SEAT

⚠ WARNING

After any adjustments, repair or service and before use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

Before performing any maintenance, adjustments or service, always turn the wheelchair power off, otherwise injury or damage may result.

Tilting the Seat Assembly

⚠ WARNING

Make sure power to the wheelchair is off before performing this procedure.

NEVER leave the seat assembly in the **UP/OPEN** position unless necessary to perform a procedure on the wheelchair - otherwise injury or damage may result.

After ANY adjustments, repair or service and before use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

NOTE: For this procedure, refer to FIGURE 9.1 on page 83.

NOTE: Removing the seat is not necessary to access the battery compartment on wheelchairs equipped with a Formula PTO Plus seating system. The seat assembly with the Formula PTO Plus seating system tilts back and props into place to provide access to the batteries and the underside of the seat.

NOTE: TDX wheelchairs have seat brackets and M71 and M91 wheelchairs have seat posts.

Tilting the Seat Assembly Back

CAUTION

Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.

1. Use the tilt function to tilt the seat back 20° to 25°.
 2. Verify the joystick on/off switch is in the off position and disconnect joystick cable.
 3. Engage the motor release levers. Refer to the wheelchair owner's manual listed in Reference Documents on page 13.
 4. Remove front rigging. Refer to the wheelchair owner's manual listed in Reference Documents on page 13.
 5. Remove the two screws and washers securing the Formula PTO Plus frame to the front seat posts/seat brackets.
 6. Firmly grasp the front edge of the seat assembly, slowly tilt the seat assembly back into the up/open position.
-

7. Remove prop rod from the clip located on the Formula PTO Plus frame and engage the prop rod end into the front seat post as shown in FIGURE 9.1.
8. Gently allow weight of seat assembly to be supported by the prop rod.

NOTE: Only leave the seat assembly in the up/open position while performing any necessary procedures. Always lower the seat assembly to the down/closed position when not servicing the wheelchair. Ensure the seat is locked in place before using.

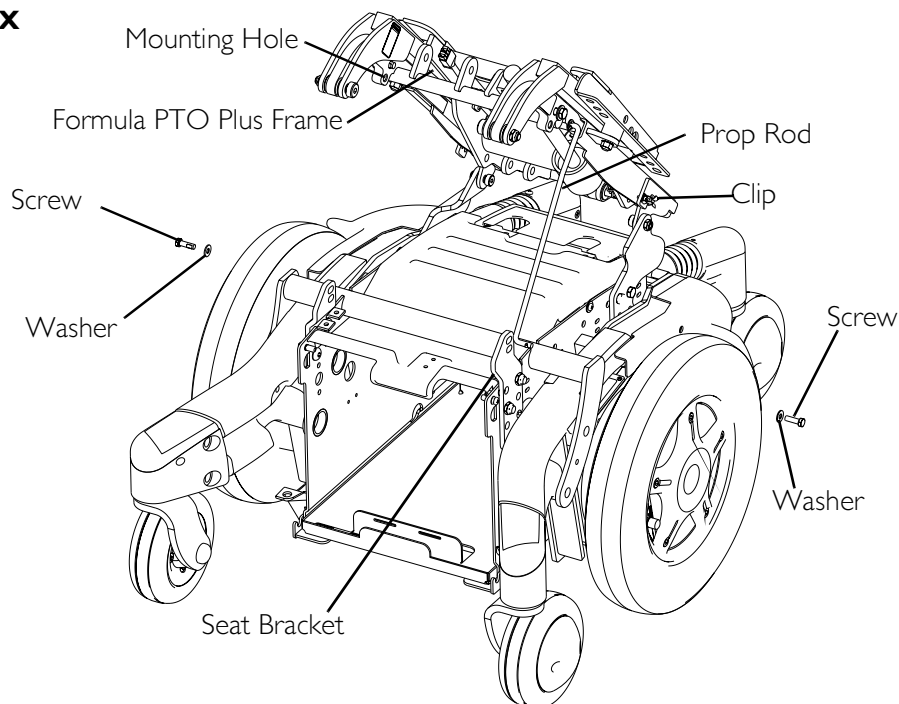
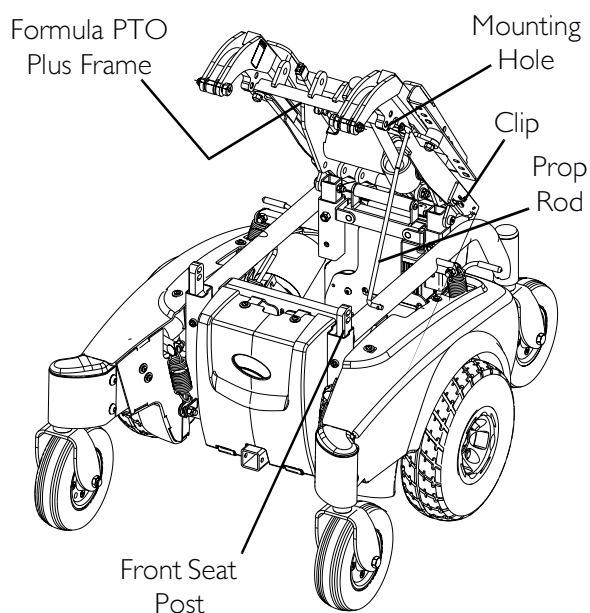
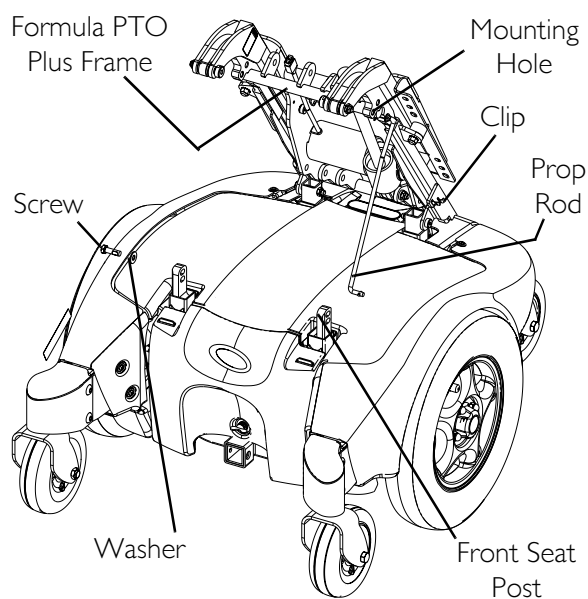
TDX**M7I****M9I**

FIGURE 9.1 Tilting the Seat Assembly

Tilting the Seat Assembly Forward

1. Using one hand, firmly grasp the front edge of the seat assembly and lift until seat assembly is no longer supported by the prop rod.
2. Disengage the prop rod from the front seat post and secure into clip.
3. Using both hands, slowly tilt the seat assembly forward into the down/closed position.

⚠ WARNING

Ensure the two screws are fully engaged and the Formula PTO Plus frame is securely locked in place before use - otherwise injury or damage may result.

4. Insert the two screws through both the Formula PTO Plus frame and the two front seat posts/seat brackets.

Removing/Installing the Seat Pan

ASBA Seats

NOTE: For this procedure, refer to FIGURE 9.2 on page 85.

NOTE: The following tools are required to perform this procedure.

- *Two 7/16-inch Sockets with Ratchet*
- *Torque Wrench*

Removing

1. Remove the seat cushion by lifting up and disengaging from strips on the seat pan.
2. Remove the two long hex screws and locknuts that secure the seat pan, seat positioning strap and pull pin to the seat frame.
3. Remove the four short hex screws, spacers, and locknuts that secure the seat pan to the seat frame.
4. Remove the seat pan.

Installing

1. Secure the rear of the seat pan, seat positioning strap, and pull pin to the seat frame with two long hex screws and locknuts. Torque to 75 in-lbs \pm 20%.
2. Secure the front of the seat pan to the seat frame with four short hex screws, spacers, and locknuts. Torque to 75 in-lbs \pm 20%.
3. Install seat cushion onto seat pan.

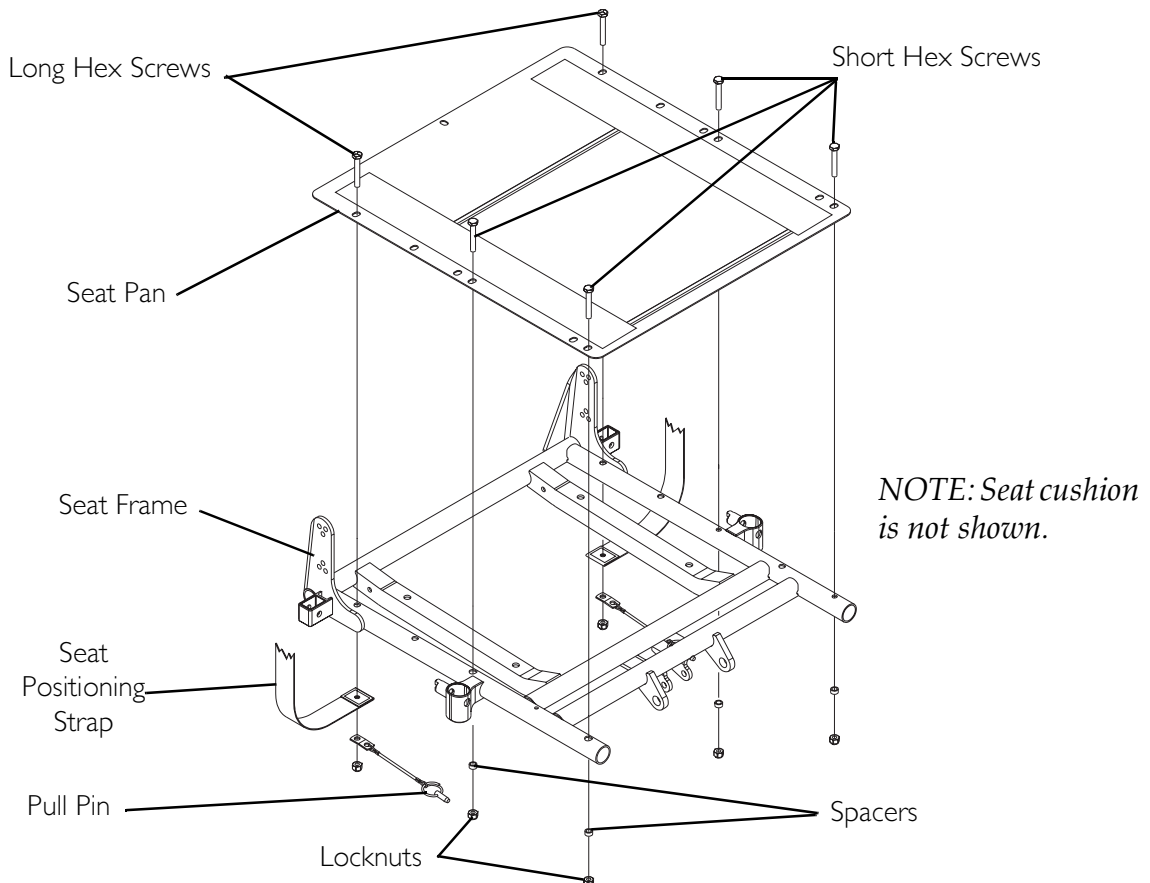


FIGURE 9.2 Removing/Installing the Seat Pan - ASBA Seats

Adjustable ASBA Seats

NOTE: For this procedure, refer to FIGURE 9.3.

Removing

1. Remove the seat cushion.
2. Remove the two socket screws securing the seat pan to the seat frame.
3. Remove the seat pan from the seat frame.

Installing

1. Position the new seat pan onto the seat frame as shown.
2. Secure the new seat pan to the seat frame using the two socket screws.
3. Install the seat cushion.

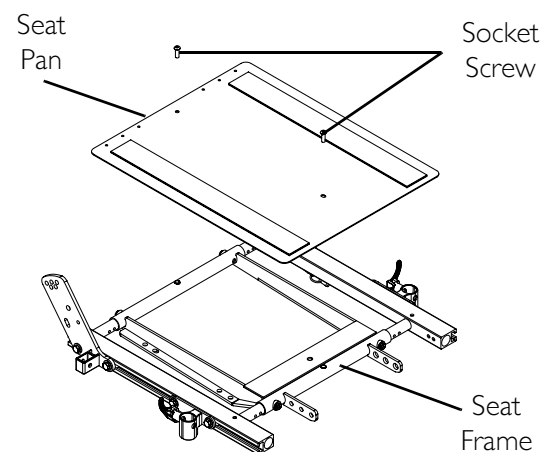


FIGURE 9.3 Removing/Installing the Seat Pan - Adjustable ASBA Seats

Adjusting the Seat Dump

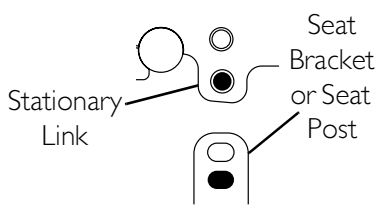
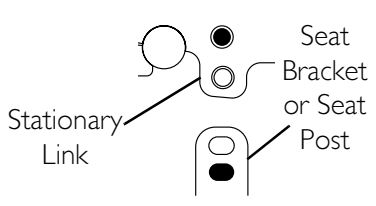
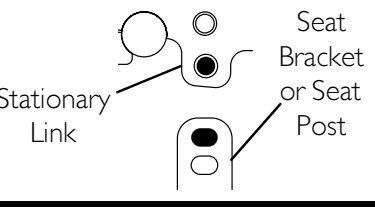
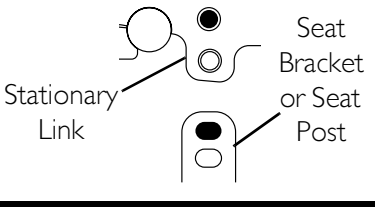
NOTE: For this procedure, refer to FIGURE 9.4 on page 87.

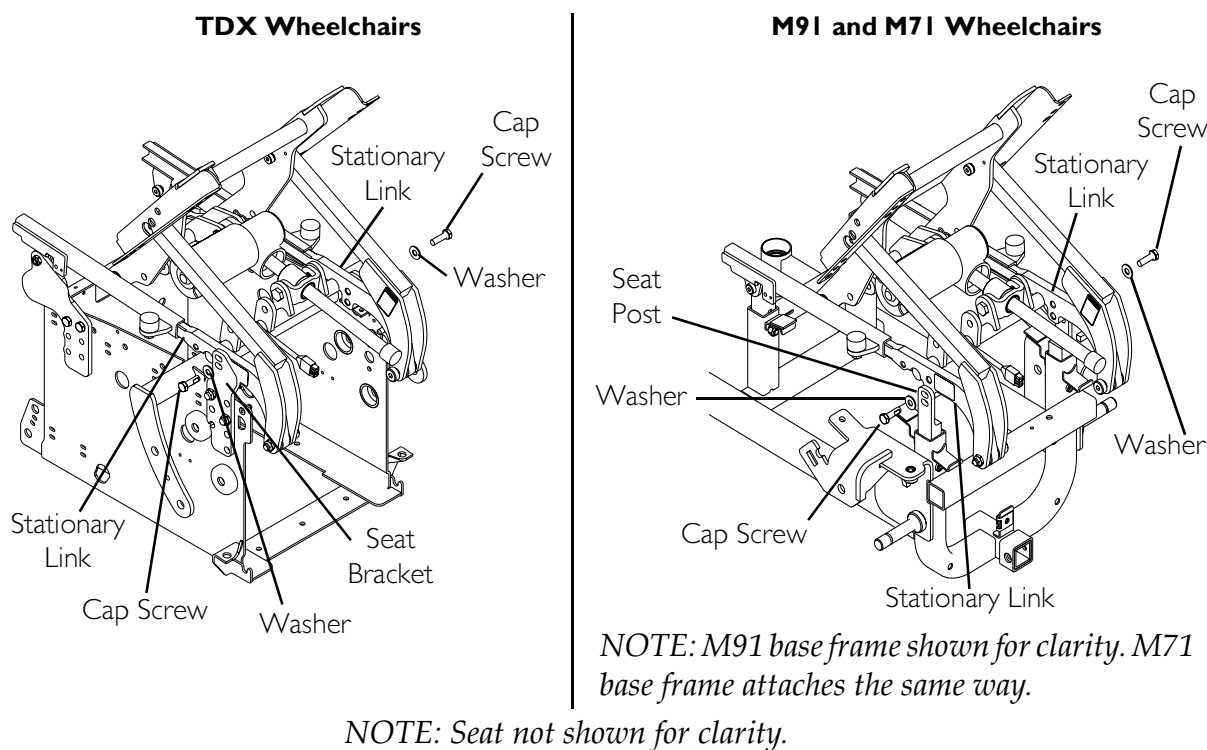
NOTE: Seat dump is the seat angle relative to the ground when the seating system is not tilted (upright position). The seat dump can be 0°, 3° or 5°.

NOTE: The stationary link attaches to the front and rear seat brackets on TDX wheelchairs and to the seat posts on M71 and M91 wheelchairs.

1. Use the powered tilt function to tilt the seat back completely.
2. Ensure the joystick is off and disconnect the joystick. Refer to the wheelchair owner's manual listed in [Reference Documents](#) on page 13.
3. Remove the two cap screws securing the stationary link to the front seat bracket or the front seat post.
4. Refer to the table, [Seat Dump Mounting Positions](#), to determine the mounting position for the desired seat dump.
5. Secure the stationary link to the front seat bracket or the front seat post with the two cap screws, using the mounting holes determined in STEP 4. Torque to 13 ft-lbs \pm 20%.

Seat Dump Mounting Positions

	LOWER STATIONARY LINK MOUNTING HOLE	UPPER STATIONARY LINK MOUNTING HOLE
LOWER FRAME BRACKET OR SEAT POST MOUNTING HOLE	<p>3° Seat Dump</p> 	<p>0° Seat Dump</p> 
UPPER FRAME BRACKET OR SEAT POST MOUNTING HOLE	<p>5° Seat Dump</p> 	<p>3° Seat Dump</p> 

**FIGURE 9.4** Adjusting the Seat Dump

Removing/Installing the Tilt Assembly

NOTE: For this procedure, refer to FIGURE 9.5 on page 89.

NOTE: The stationary link attaches to the front and rear seat brackets on TDX wheelchairs and to the seat posts on M71 and M91 wheelchairs.

Removing the Tilt Assembly

1. Use the powered tilt feature to tilt the seat back completely.
2. Note the mounting holes used to secure the front of the stationary link to the front seat brackets or the front seat posts for proper reinstallation.
3. Remove the two cap screws and washers securing the stationary link to the front seat brackets or the front seat posts.
4. Remove the two locknuts, washers* and shoulder screws securing the stationary link to the rear seat brackets or the rear seat posts.

**NOTE: Washers are present only on TDX wheelchairs.*

5. Carefully remove the tilt assembly and set aside, making sure the cables DO NOT get crushed.

Installing the Tilt Assembly

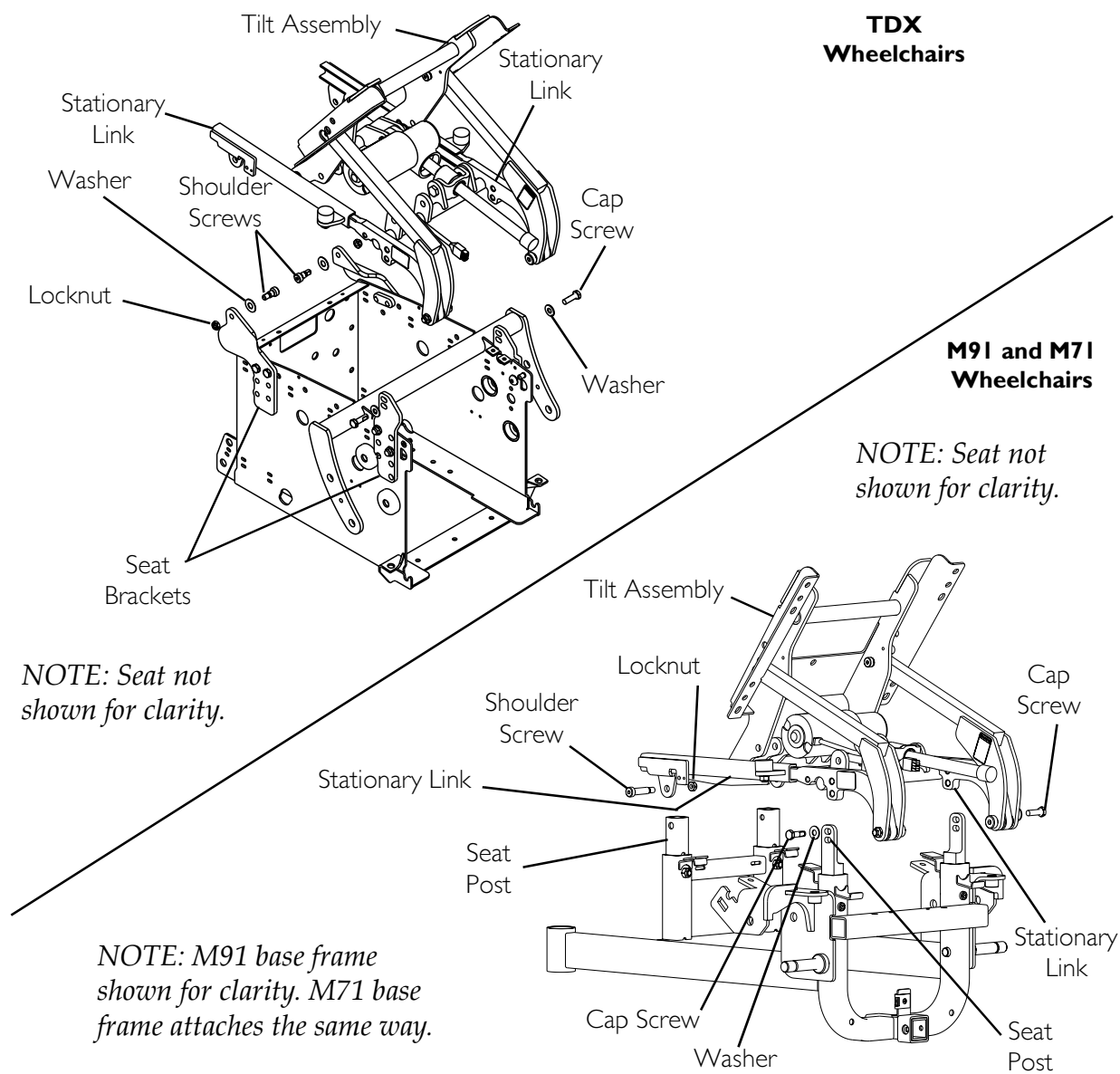
CAUTION

Ensure the cables **DO NOT become stressed (pulled), entangled or crushed when setting the seat aside.**

1. Align the rear stationary link mounting holes with the rear seat bracket mounting holes or the rear seat post mounting holes.
2. Secure the rear stationary link to the rear seat brackets or the rear seat posts using the two locknuts, washers* and shoulder screws. Torque locknuts to 23 ft-lbs \pm 20%.

**NOTE: Washers are present only on TDX wheelchairs.*

3. Align the front stationary link mounting holes with the front seat bracket mounting holes or seat post mounting holes as noted in STEP 2 of Removing the Tilt Assembly on page 87.
4. Secure the front stationary link mounting holes with the front seat bracket mounting holes or seat post mounting holes using the two cap screws and washers. Torque to 13 ft-lbs \pm 20%.

**FIGURE 9.5** Removing/Installing the Tilt Assembly

Adjusting the Seat Height

TDX Wheelchairs

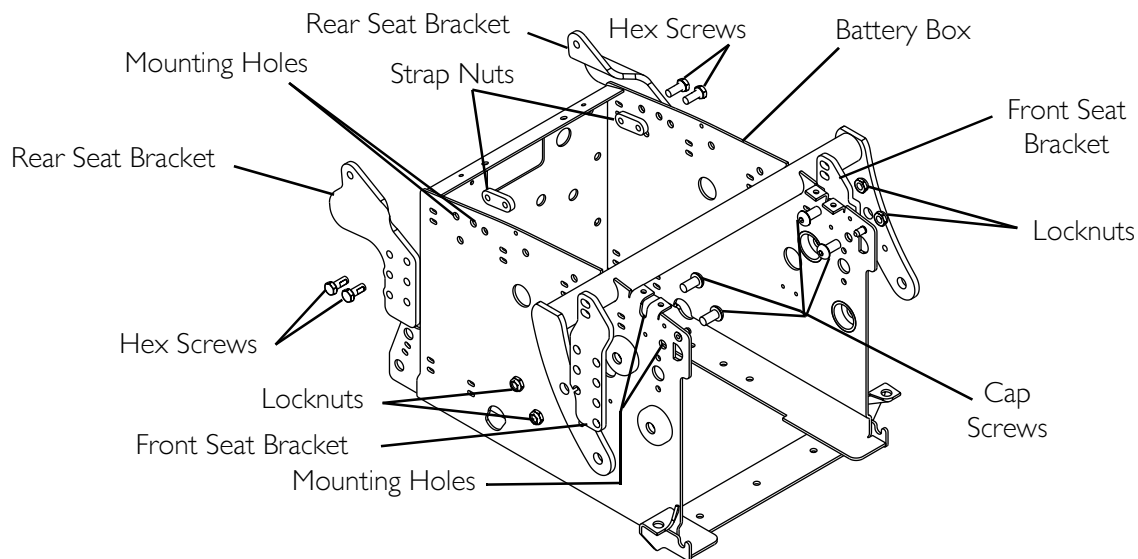
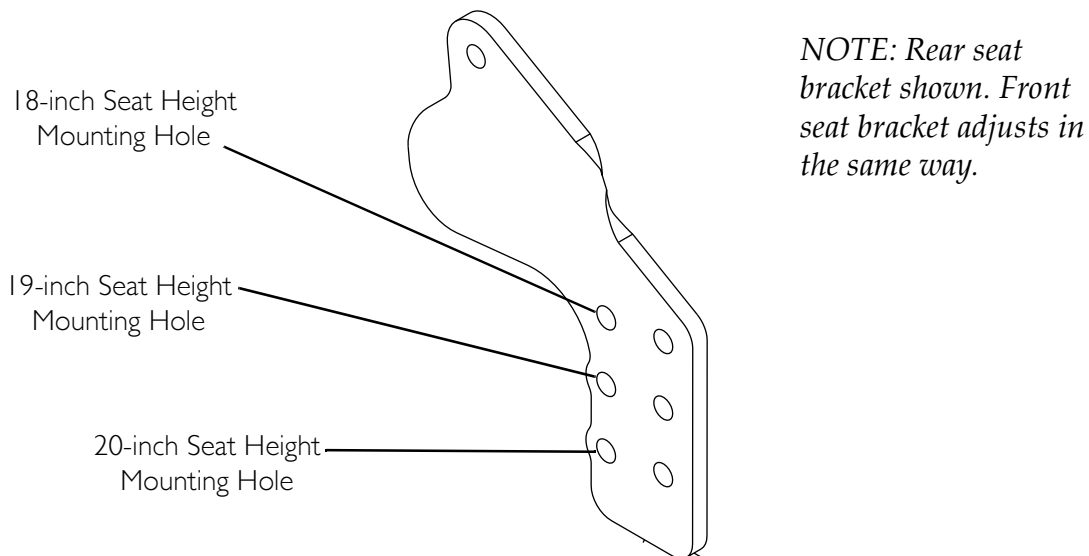
WARNING

All seat brackets *MUST* be adjusted to the same height.

NOTE: For this procedure, refer to FIGURE 9.6 on page 91.

NOTE: The seat height can be adjusted to one of three positions (18, 19 or 20 inches).

1. Remove the tilt assembly. Refer to Removing/Installing the Tilt Assembly on page 87.
2. Remove the batteries. Refer to TDX Batteries on page 173.
3. Remove the four hex screws and two strap nuts securing the rear seat brackets to the battery box.
4. Remove the four cap screws and locknuts securing the front seat brackets to the battery box.
5. Position one rear seat bracket at the desired height.
6. Secure the rear seat bracket to the battery box with two hex screws and one strap nut. Torque to 13 ft-lbs \pm 20%.
7. Repeat STEPS 5 and 6 for the remaining rear seat bracket, using the same set of mounting holes used in STEP 5.
8. Using the same set of mounting holes used in STEP 5, secure the front seat bracket to the battery box using two cap screws and locknuts. Torque locknuts to 23 ft-lbs \pm 20%.
9. Repeat STEP 8 for the remaining front seat bracket.
10. Install the batteries. Refer to TDX Batteries on page 173.
11. Install the tilt assembly. Refer to Removing/Installing the Tilt Assembly on page 87.

**DETAIL "A" - SEAT HEIGHTS****FIGURE 9.6** Adjusting the Seat Height - TDX Wheelchairs**M7I Wheelchairs****⚠ WARNING**

DO NOT adjust the seat height. Adjusting the seat height from the factory setting will make the wheelchair unstable and injury or damage may occur. The M7I wheelchair seat should only be mounted in mounting hole B (FIGURE 9.7).

M9I Wheelchairs

⚠ WARNING

All seat posts **MUST** be adjusted to the same height.

***DO NOT** use Mounting Hole A. This mounting hole combination will cause interference between the front riggings and/or the seat frame and wheelchair base.

****ALL M7I Wheelchairs and M9I Wheelchairs for users over 250 lbs. MUST** use Mounting Hole B.

*****Mounting Holes C, D and E MUST** only be used for M9I Users under 250 lbs.

NOTE: For this procedure, refer to FIGURE 9.7.

NOTE: The seat can be adjusted to four height positions in 1/2-inch increments.

1. Remove the tilt assembly. Refer to Removing/Installing the Tilt Assembly on page 87.
2. Remove the mounting screw and locknut that secure the seat post to the support tube.
3. Adjust seat post to desired mounting position.
4. Reinstall mounting screw and locknut. Torque locknuts to 13 ft-lbs \pm 20%.
5. Repeat STEPS 2-4 for the three remaining seat posts, using the same mounting hole for each.
6. Reinstall the tilt assembly. Refer to Removing/Installing the Tilt Assembly on page 87.

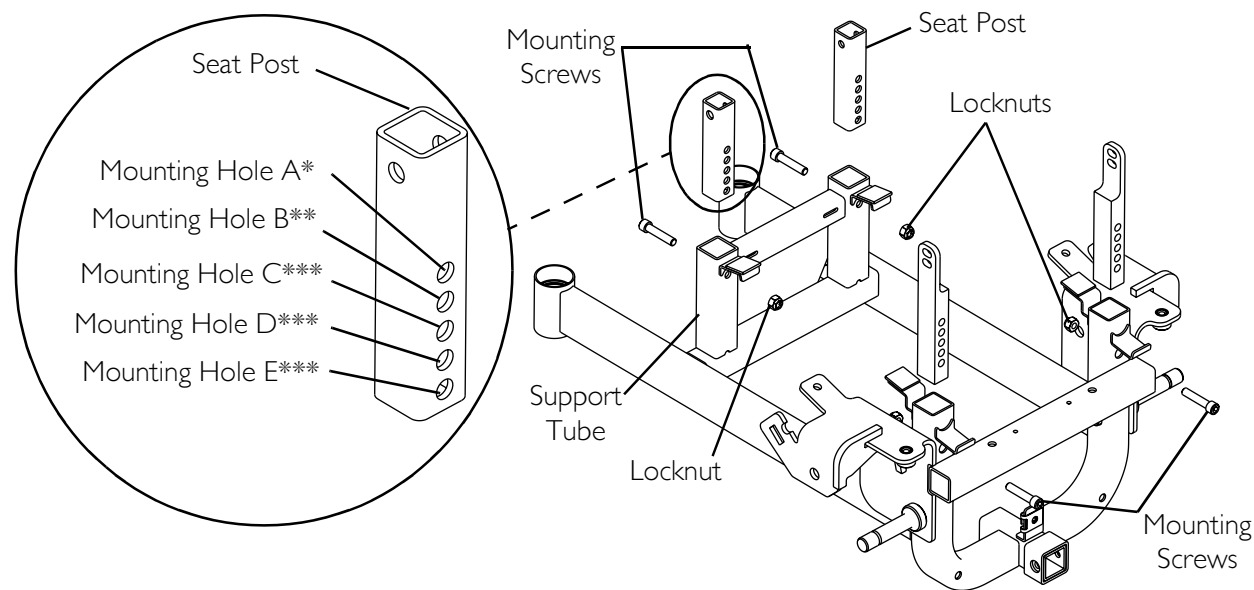


FIGURE 9.7 Adjusting the Seat Height - M9I Wheelchairs

Adjusting the Seat Width

ASBA Seats

NOTE: The seat frame must be replaced to change the seat width. Refer to Removing/Installing the Seat Frame on page 100.

Adjustable ASBA Seats

NOTE: For this procedure, refer to FIGURE 9.8 on page 95.

Seat Width Adjustment Table

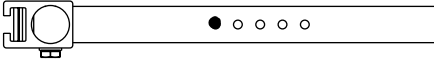
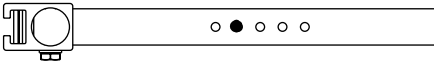

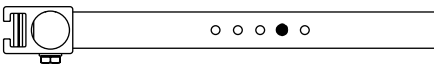
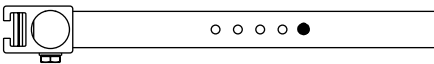
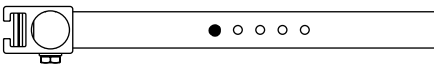
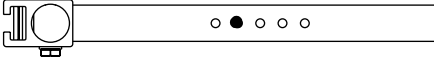
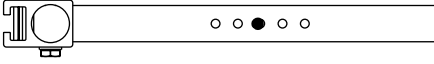
FRAME SIZE	SEAT WIDTH RANGE
SMALL	16 - 20 inches in 1-inch increments
LARGE	20 - 22 inches in 1-inch increments

NOTE: If adjusting the seat width beyond the range of the existing seat frame, the crossbars must be replaced.

NOTE: The spreader bar must be replaced for seating systems ordered with the BPO (Back Post Only) option.

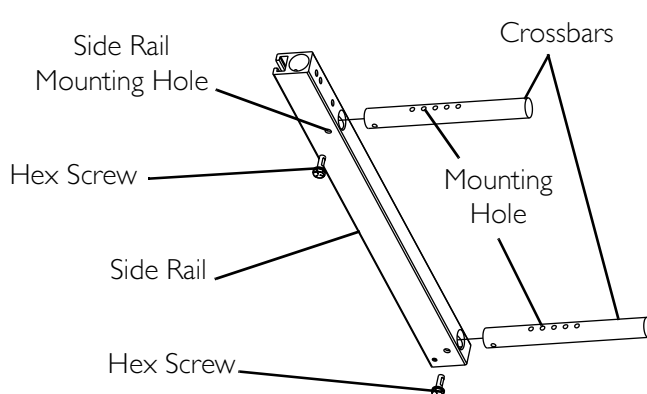
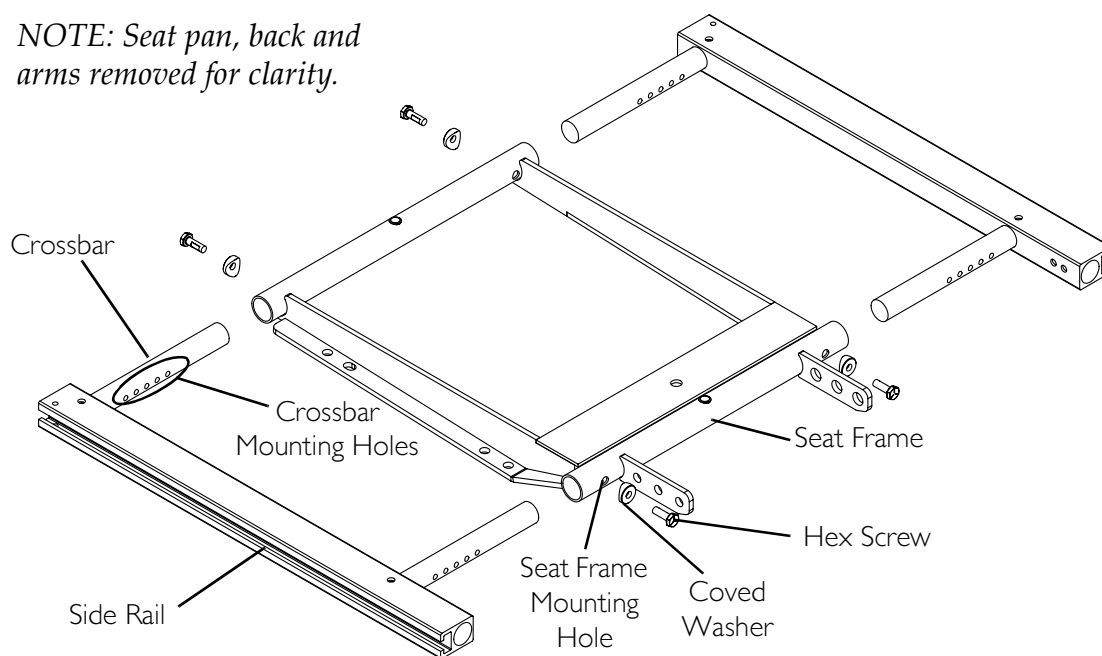
1. BPO Option Only - Remove the spreader bar. Refer to Removing/Installing the Spreader Bar on page 78.
2. Remove the hex screw and coved washers securing each crossbar to the seat frame.
3. Examine the Seat Width Adjustment Table to determine if the seat width adjustment is within or beyond the range of the existing seat frame.
4. Perform one of the following:
 - Within the Range - Proceed to STEP 5.
 - Beyond the Range - Perform the following steps (Detail "A"):
 - i. Remove the two hex screws securing the crossbars to each side rail.
 - ii. Remove the crossbars from the side rails.
 - iii. Insert new crossbars into the side rails.
 - iv. Position the new crossbars so the mounting hole is facing down and aligned with the side rail mounting hole.
 - v. Secure the new crossbars to the side rails using the two hex screws. Torque the hex screws to 75 in-lbs.
5. Pull/push the side rails (Detail "B") to the desired width shown in the following table.

Seat Width Mounting Holes

SEAT WIDTH	SIDE RAIL MOUNTING HOLES*
16-INCH	
17-INCH	
18-INCH	
19-INCH	
20-INCH (16-20-INCH FRAME)	
20-INCH (20-24-INCH FRAME)	
21-INCH	
22-INCH	
*NOTE: Only left side rail shown. Use the same mounting hole for opposite side rail.	

6. Align the crossbar mounting holes with the seat frame mounting holes.
7. Secure each crossbar to the seat frame with a hex screw and coved washer. Torque the hex screw to 75 in-lbs.
8. BPO Option Only - Install the new spreader bar. Refer to Removing/Installing the Spreader Bar on page 78.

NOTE: Seat pan, back and arms removed for clarity.



DETAIL "A" - REPLACING THE CROSSBARS

FIGURE 9.8 Adjusting the Seat Width - Adjustable ASBA Seats

Adjusting the Seat Depth

ASBA Seats

NOTE: The seat frame must be replaced to change the seat depth. Refer to Removing/Installing the Seat Frame on page 100.

Adjustable ASBA Seats

NOTE: For this procedure, refer to FIGURE 9.9 on page 97.

1. Examine the following chart to determine if the desired seat depth adjustment is within or beyond the range of the existing seat frame.

FRAME SIZE	SEAT DEPTH RANGE
SMALL	16 - 19 inches in 1-inch increments
LARGE	19 - 22 inches in 1-inch increments

2. Perform one of the following:
 - Seat Depth Adjustment is WITHIN the Range of Existing Seat Frame - Proceed to STEP 3.
 - Seat Depth Adjustment is BEYOND the Range of Existing Seat Frame - Replace the side rails. Refer to Removing/Installing Side Rails on page 97.
3. Loosen, but DO NOT remove, the four hex screws and washers securing the bottom of the cane brackets to the side rails.
4. Loosen, but DO NOT remove, the four hex screws securing the front arm sockets to the side rails.
5. Use the following Seat Depth Adjustment Table to determine the distance required to obtain the desired seat depth.

Seat Depth Adjustment Table

SEAT DEPTH	DISTANCE* (IN INCHES)
16-INCH	5.50
17-INCH	4.50
18-INCH	3.50
19-INCH	2.50 (Small Frame) 5.50 (Large Frame)
20-INCH	4.50
21-INCH	3.50
22-INCH	2.50

*NOTE: Distance is between the rear of the rear arm socket and the rear of the side rail (Detail "A").

6. Measure the distance determined in STEP 5 from the end of the side rail.
7. Make a pencil mark to indicate this position on the side rail.
8. Slide the cane brackets along the side rails to align the rear of the rear arm socket with the pencil mark made in STEP 7.
9. Secure the cane brackets to the side rails with the four hex screws and washers. Torque the hex screws to 13 ft-lbs.
10. Secure the front arm sockets to the side rails with the four hex screws. Torque the hex screws to 13 ft-lbs.

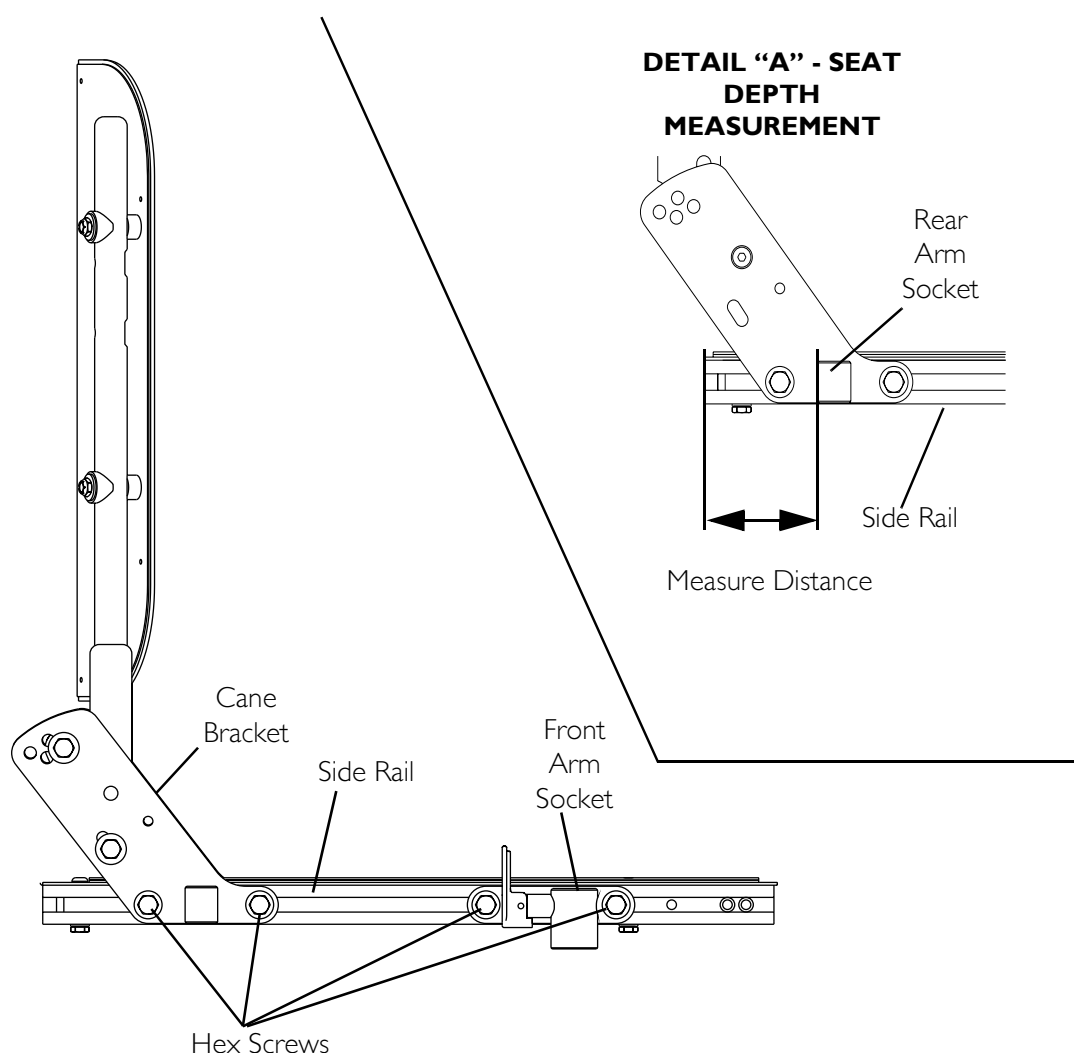


FIGURE 9.9 Adjusting the Seat Depth - Adjustable ASBA Seats

Removing/Installing Side Rails

NOTE: For this procedure, refer to FIGURE 9.10 on page 98.

NOTE: This procedure applies to Adjustable ASBA seats only.

Removing Side Rails

1. Remove both armrests.
2. Remove the two hex screws, washer and lanyard securing the crossbars to the side rail.
3. Loosen, but DO NOT remove, the four hex screws securing the cane brackets to the side rails.
4. Loosen, but DO NOT remove, the four hex screws securing the front arm sockets to the side rails.
5. Use a screwdriver to gently tap the two roll pins out of the side rails.

6. Slide both cane brackets (with T-nuts and back canes) out of the slots in the side rails.
7. Slide both front arm sockets (with T-nuts) out of the slots in the side rails.
8. Pull both side rails off the crossbars.

Installing Side Rails

1. Install new side rails onto crossbars.

NOTE: Ensure long end of side rail is towards the front of the wheelchair.

2. Secure the side rails to the crossbars with the hex screws, washer and lanyard. Torque to 75 in-lbs.
3. Slide cane brackets (with T-nuts and back assembly) into the slots in the side rails.
4. Slide front arm sockets (with T-nuts) into the slots in the side rails.
5. Use a rubber mallet to tap the two roll pins into the side rails.
6. Tighten the four hex screws to secure the cane brackets to the side rails. Torque to 13 ft-lbs.
7. Install the armrests.

NOTE: It may be necessary to slide the front arm sockets to the proper position to install the armrests.

8. Tighten the four hex screws to secure the front arm sockets to the side rails. Torque to 13 ft-lbs.

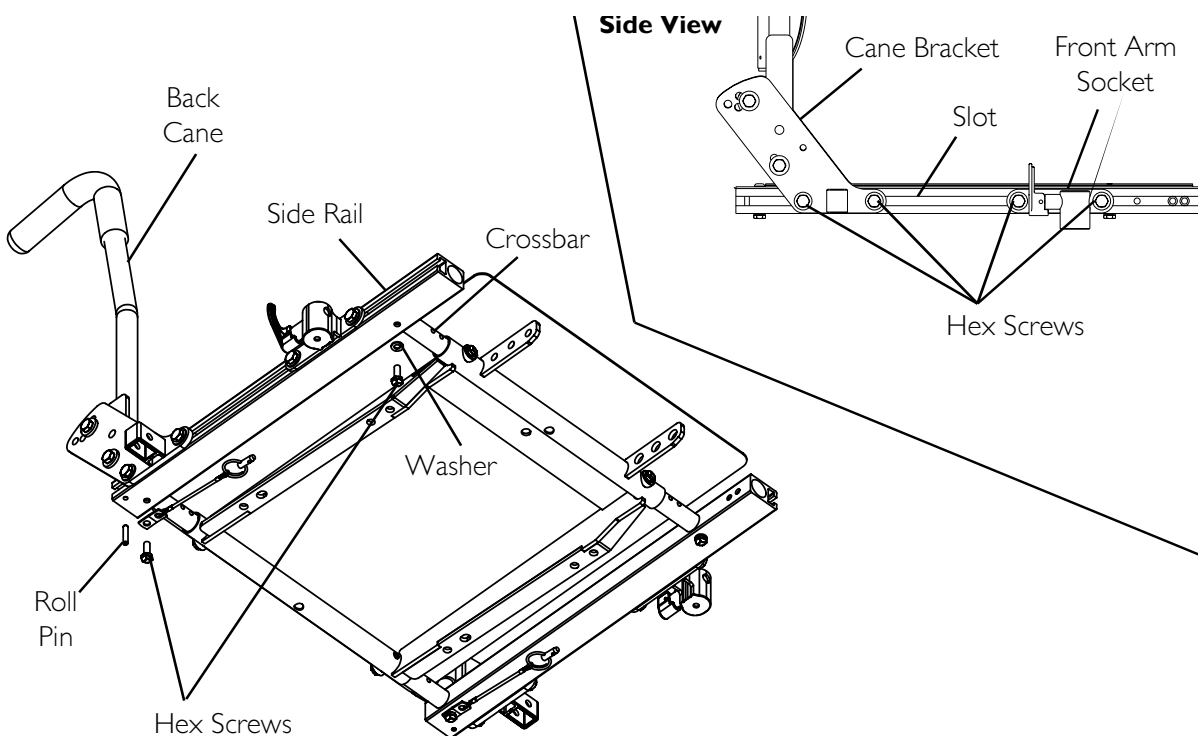


FIGURE 9.10 Removing/Installing Side Rails

Adjusting/Replacing Telescoping Front Rigging Support

ASBA Seats

NOTE: For this procedure, refer to FIGURE 9.11

NOTE: The two telescoping front rigging supports can be positioned at different depths depending on the need of the user.

1. Remove the two mounting screws, spacers and locknuts that secure the telescoping front rigging support to the seat frame.
2. Perform one of the following:
 - Slide existing telescoping front rigging support to one of three depth positions.
 - Remove existing telescoping front rigging.
3. Secure telescoping front rigging at desired depth with existing two mounting screws, spacers, and locknuts. Torque locknuts to 75 in-lbs \pm 20%.

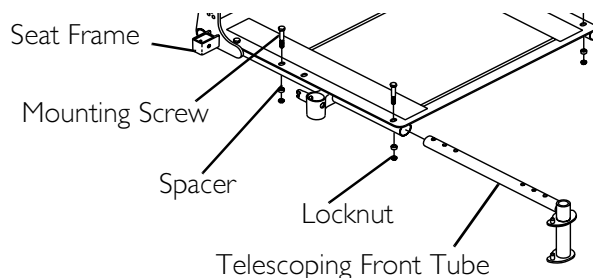


FIGURE 9.11 Adjusting/Replacing Telescoping Front Rigging Support - ASBA Seats

Adjustable ASBA Seats

NOTE: For this procedure, refer to FIGURE 9.12 on page 100.

1. Remove the two cap screws, spacers and threaded blocks securing the telescoping front tube to the side rail.
2. Perform one of the following:
 - Slide existing telescoping front rigging support to one of five depth positions.
 - Remove existing telescoping front rigging.
3. Secure the telescoping front tube to the side rail at the desired depth with the existing two cap screws, spacers and threaded blocks. Torque cap screws to 79 in-lbs.
4. Repeat STEPS 1 to 3 on the opposite side, if desired.

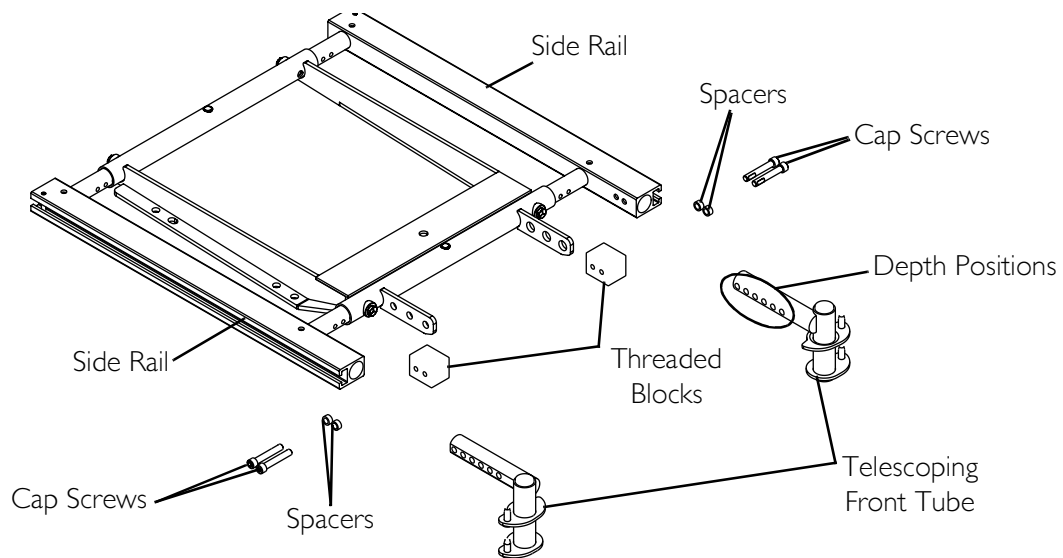


FIGURE 9.12 Adjusting/Replacing Telescoping Front Rigging Support

Removing/Installing the Seat Frame

NOTE: For this procedure, refer to FIGURE 9.13 on page 102.

Removing

1. Remove the seat pan. Refer to Removing/Installing the Seat Pan on page 84.
2. Disconnect the joystick from the controller.
3. If replacing the seat frame, perform the following steps:
 - A. Remove the back canes. Refer to Removing/Installing the Back Canes on page 75.
 - B. Remove the armrests. Refer to the wheelchair owner's manual.
4. Remove the four locknuts, washers and hex bolts securing the seat frame to the tilt assembly.
5. Remove the seat frame.

Installing

1. Refer to the one of the following tables to determine the proper mounting holes to use when installing the seat frame.

ASBA Seat Frame Positions

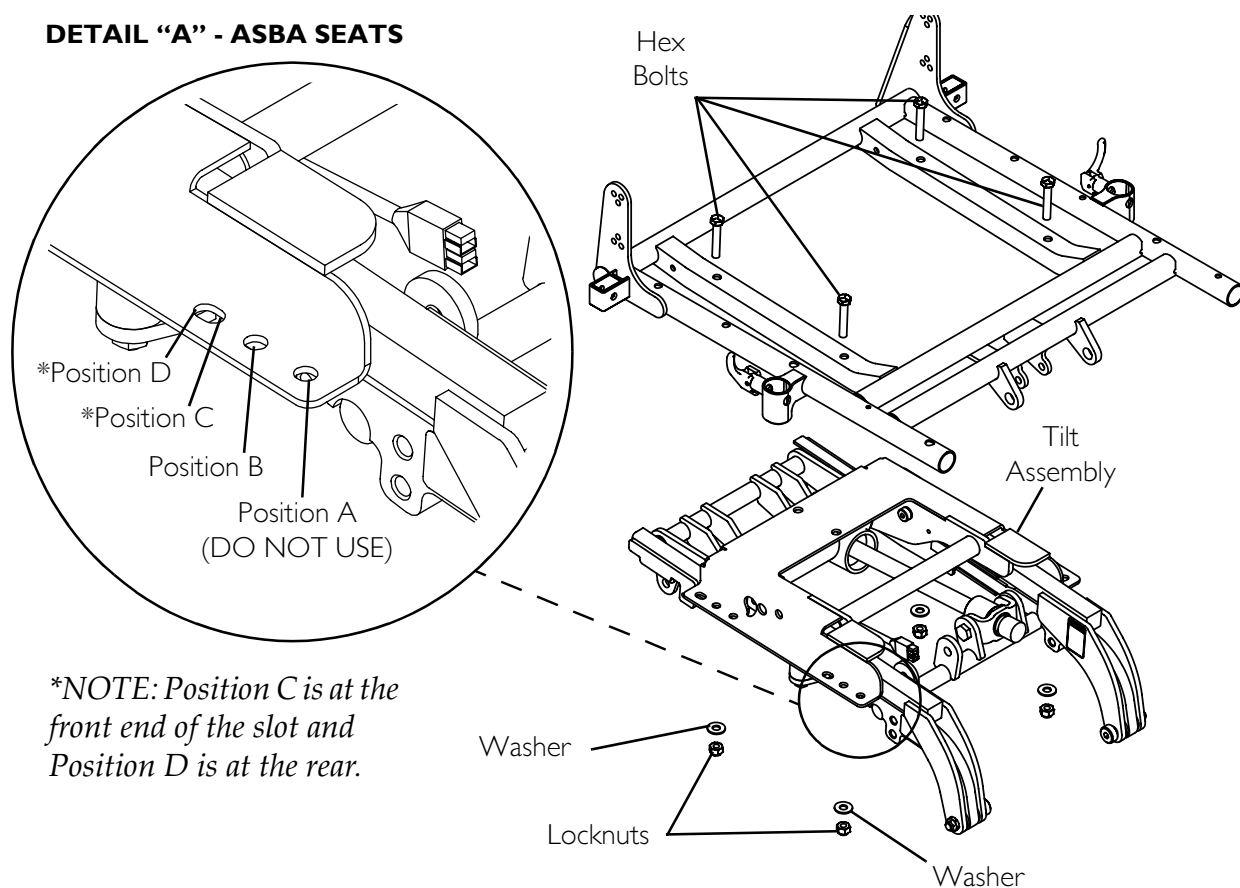
WHEELCHAIR BASE	SEAT DEPTH	POSITION
PRONTO M7I	16 - 17 inch	B
	18 - 20 inch	D
PRONTO M9I	16 - 17 inch	B
	18 - 21 inch	C
	22 inch	D
TDX	16 - 18 inch	B
	19 - 22 inch	D
<i>NOTE: DO NOT use Position A.</i>		

Adjustable ASBA Seat Frame Positions

WHEELCHAIR BASE	SEAT WIDTH	SEAT DEPTH	POSITION
PRONTO M7I	All	16 - 17 inch	BC
		18 - 19 inch	AD
		19-20	BD
PRONTO M9I	Up to 22-inch	16 - 17 inch	AD
		18 - 22 inch	BD
	23 and 24-inch	All	BD
TDX	Up to 22-inch	16 - 17 inch	BD
		18 - 19 inch	AD
		20 - 22 inch	BD

2. Position the seat frame on top of the tilt assembly.
3. Align the seat frame mounting holes with the tilt frame mounting holes determined in STEP 1.
4. Secure the seat frame to the tilt assembly using the four locknuts, washers and hex bolts. Torque the locknuts to 13 ft-lbs \pm 20%.

DETAIL “A” - ASBA SEATS



DETAIL “B” - ADJUSTABLE ASBA SEATS

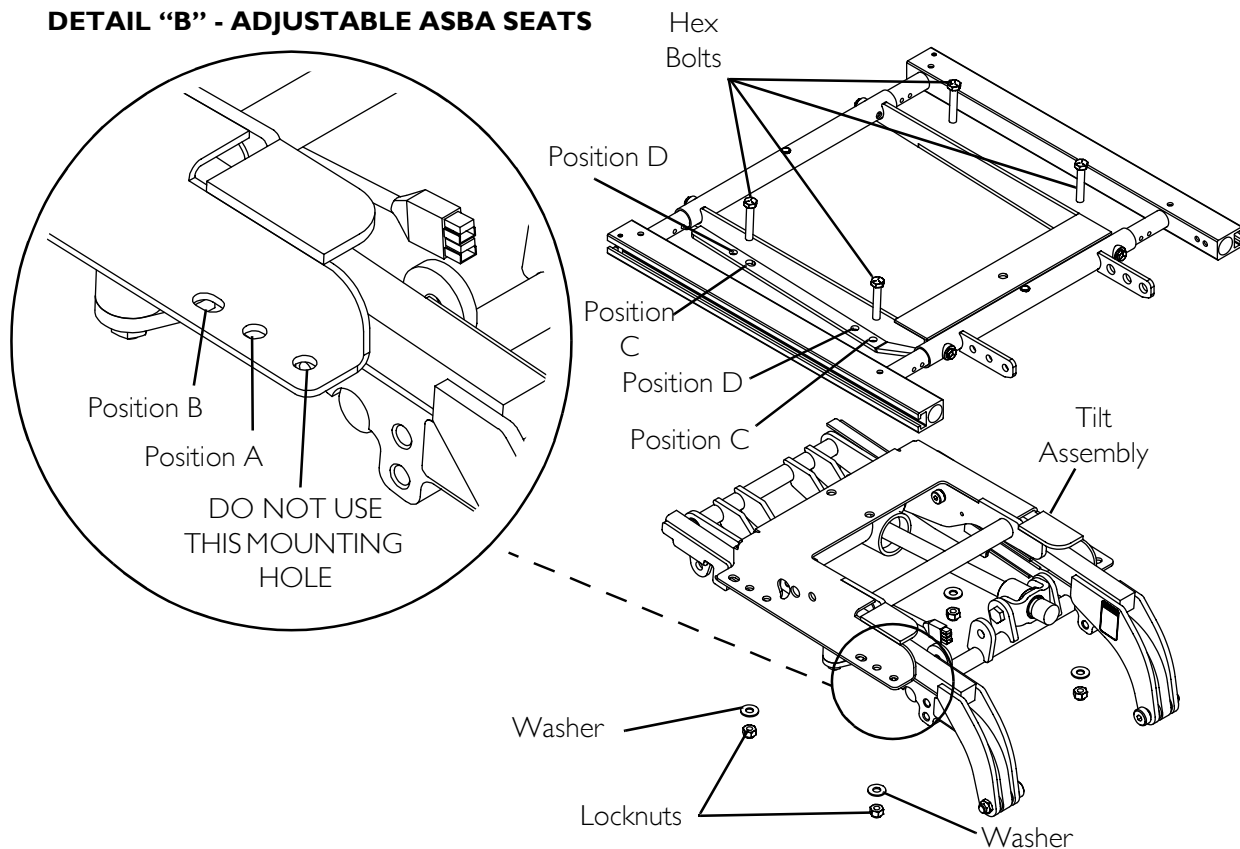


FIGURE 9.13 Removing/Installing the Seat Frame

SECTION 10—TILT

⚠ WARNING

After any adjustments, repair or service and before use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

Before performing any maintenance, adjustments or service, always turn the wheelchair power off, otherwise injury or damage may result.

A Note About Drive Lock-Out

⚠ WARNING

NEVER operate the wheelchair while the back is in any tilted/back angle position over 20° relative to the vertical position. If the drive lock-out does not stop the wheelchair from operating in a tilt/back angle position over 20° relative to the vertical position, **DO NOT** operate the wheelchair. The drive lock-out settings **MUST** be adjusted. Refer to Adjusting/Replacing the Drive Lockout Sensor on page 136.

The wheelchair user **MUST** have a clear line of sight to drive safely. On initial chair delivery and after adjusting the back angle, drive lock-out switch or tilt system, tilt the seat back to the farthest driving position immediately before drive lock-out engages and ensure there is a clear line of sight present in which to drive the wheelchair. If a clear line of sight is not present, have the back angle repositioned or readjust the lockout angle such that safe driving with a clear line of sight is achieved. Otherwise injury or damage may occur.

One of the following will occur when the drive lock-out feature has been activated:

- MK5 Systems - The LED on the single function toggle switch will light when the drive lock-out feature has been activated.
- MPJ+ Joysticks Only - ⚠ TILT WARNING or ⚠ SPM Inhibited displays on the joystick or display unit.
- SPJ+ Joysticks Only - Left to right chase alternating with a steady display.

Drive lock-out is a feature designed to prevent the wheelchair from being driven after the seating system has been tilted beyond 20°* relative to the vertical position. The back can be positioned at a 10° relative offset to the seat base, thereby resulting in a back angle potential of 30° before which the drive lock-out is activated. This may affect the wheelchair user's line of sight while driving. Make sure the wheelchair user can see properly to ensure safe driving.

**NOTE: 20° back angle can be any combination of tilt, back angle and/or surface angle.*

NOTE: Refer to Typical Product Parameters - Formula PTO Plus on page 14 for tilt angle ranges.

Operating the Powered Tilt System

⚠ WARNING

Refer to **A Note About Drive Lock-Out** on page 103 **BEFORE** performing this procedure.

Pinch points may occur when returning the seat from any tilted position to the full upright position. Make sure the hands and body of both the occupant and attendants/bystanders are clear of all pinch points before returning the seat to the full upright position.

DO NOT operate the tilt function near or under a fixed object such as a table or desk.

⚠ ACTUATOR CONTROL WARNING

MK5 Systems

Use only the actuator controls listed in the following chart to activate the tilt function. **DO NOT USE** any other actuator controls. Such devices may result in excess heating and cause damage to the actuator and associated wiring and could cause a fire, death, physical injury or property damage. If such devices are used, Invacare shall not be liable and the limited warranty is void.

SEATING SYSTEM	ACTUATOR CONTROL			
	TRSS	TRECM	TAC	SAC
FORMULA PTO PLUS	Y	N	Y	Y
FORMULA PTO PLUS WITH POWER LEGS	N	Y	N	N

MK6i Systems

Use only the actuator controls listed in the following chart to activate the tilt functions. **DO NOT USE** any other actuator controls. Such devices may result in excess heating and cause damage to the actuator and associated wiring and could cause a fire, death, physical injury or property damage. If such devices are used, Invacare shall not be liable and the limited warranty is void.

SYSTEM TYPE	JOYSTICK	POWERED SEATING CONTROL	
		4 POLE MOTOR	
		SWITCH OPTION	THROUGH THE JOYSTICK (TTJ)
Single Actuator (Tilt Only)	MK6i SPJ+ w/PSS	Powered Seating Switch	No
	MK6i SPJ+ w/ACC		Yes
	MPJ+		Yes with SANODE
Multiple Actuator (Tilt Only with Power Elevating Legrests)	MPJ+	4-Way Switch	Yes with Multiple Actuator Interface Box

Using the Single Function Toggle Switch (TRSS)

NOTE: For this procedure, refer to FIGURE 10.1 on page 105.

NOTE: The single function toggle switch is used on systems with MK₅ electronics only.

NOTE: The directions indicated in this procedure apply to wheelchairs with the single function toggle switch mounted on the right side of the wheelchair.

Increasing the Tilt Angle

1. Make sure the wheelchair is on a level surface.
2. Push the single function toggle switch FORWARD towards the FRONT of the wheelchair until the desired angle is achieved.

Decreasing the Tilt Angle

1. Pull the single function toggle switch BACK towards the REAR of the wheelchair until the desired angle is achieved.

Single Function Toggle Switch

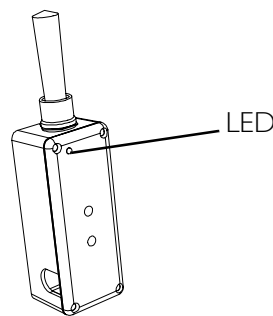


FIGURE 10.1 Using the Single Function Toggle Switch (TRSS)

Using the Powered Seating Switch

NOTE: The powered seating switch can be used with all MK6i joysticks.

NOTE: The powered seating switch will alternate functions (increase tilt angle, decrease tilt angle) after it has been released for a minimum of three seconds.

1. Make sure the wheelchair is on a level surface.
2. Press the powered seating switch once to activate the actuator.
3. Press the powered seating switch again (after at least 3 seconds) to activate the actuator in the opposite direction.

Using the MK6i SPJ+ w/ACC Joystick

NOTE: For this procedure, refer to FIGURE 10.2 on page 106.

1. Make sure the wheelchair is on a level surface.
2. Press the mode button to switch from driving mode to tilt mode.

NOTE: The LED will light up with a circle around it.

3. Move the joystick:
 - Forward - Tilts the seat upright.
 - Backward - Tilts the seat back.

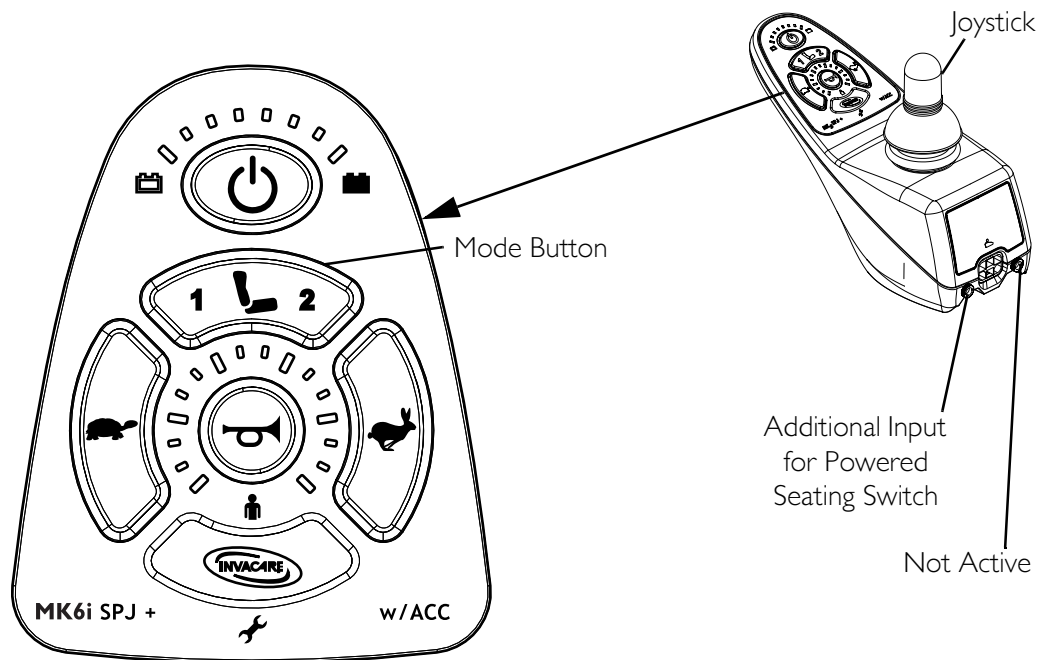








FIGURE 10.2 Using the MK6i SPJ+ w/ACC Joystick

Using the MK6i MPJ+, MK6i PSR or MK6i PSF Joystick

NOTE: For this procedure, refer to FIGURE 10.3 on page 108.

- 1. Make sure the wheelchair is on a level surface.
- 2. Select a drive that has the Actuator Control Switch Mode icon  displayed.
- 3. Select the Actuator Control Switch Mode icon (Detail “A”).
- 4. Four of the following icons will display when Actuator Control Switch Mode is selected:

NOTE: The location of the icons indicates the joystick direction or quadrant (Detail “B”).

ICON	DESCRIPTION
	Conventional Tilt Operations
	Combined Power Leg Operations
	Right Leg Operations
	Left Leg Operations
	No powered seating operation has been programmed for this quadrant.

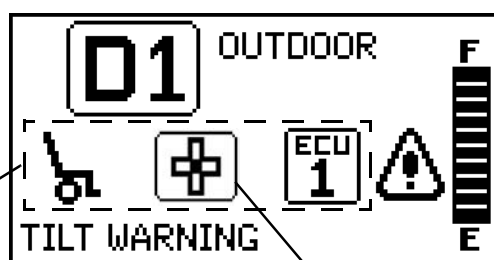
NOTE: The three icons indicate up/down, up or down, respectively.

- 5. Select the desired operation using the joystick or an equivalent switch.

NOTE: While operating the powered seating system, the selected icon will display on the screen along with text indicating the current operation (Detail “C”).

**DETAIL “A” -
SELECTING THE
ACTUATOR
CONTROL SWITCH
MODE**

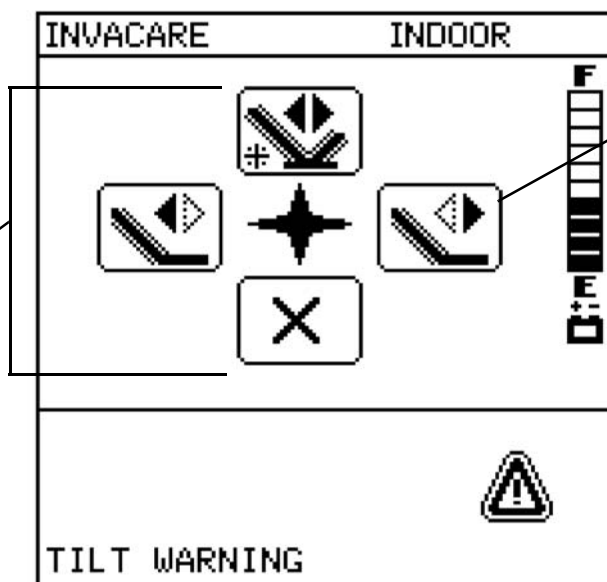
Mode Icons



Actuator Control Switch Mode Icon

**DETAIL “B” -
ACTUATOR
CONTROL SWITCH
MODE EXAMPLE
SCREEN**

Operation
Icons



Tilt Down Icon
(Move the joystick
right to use this
function)

**DETAIL “C” -
EXAMPLE SCREEN
DURING POWERED
SEATING
OPERATION**

Icon

Text

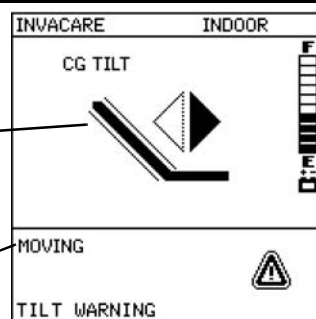


FIGURE 10.3 Using the MK6i MPJ+, MK6i PSR or MK6i PSF Joystick

Removing/Installing the Actuator Shroud

NOTE: For this procedure, refer to FIGURE 10.4 on page 109.

NOTE: Reverse this procedure to install the actuator shroud.

1. Remove the seat pan. Refer to Removing/Installing the Seat Pan on page 84.
2. Remove the two screws and washers securing the actuator shroud.
3. Remove the actuator shroud.

NOTE: Tilting the actuator shroud may be necessary.

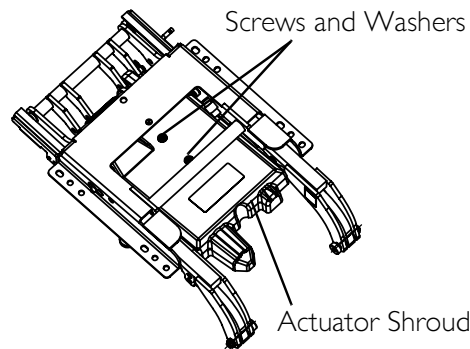


FIGURE 10.4 Removing/Installing the Actuator Shroud

Replacing the Tilt Actuator

Preparing to Replace the Tilt Actuator

NOTE: For this procedure, refer to FIGURE 10.5 on page 110.

1. Remove the seat pan. Refer to Removing/Installing the Seat Pan on page 84.
2. Remove the actuator shroud. Refer to Removing/Installing the Actuator Shroud on page 108.
3. Perform one of the following:
 - Wheelchairs with the Spring Assist Assembly - Remove the spring assist assembly. Refer to Removing/Installing the Spring Assist Assembly on page 116.
 - Wheelchairs without Spring Assist - Use the tilt function to tilt the seat assembly back.
4. Turn the joystick off.
5. Disconnect the joystick.
6. Remove the rear shroud from the wheelchair. Refer to the owner's manual listed in Reference Documents on page 13.
7. Disconnect the actuator from the cam harness cable (YELLOW connector) (not shown).
8. Cut the large tie-wrap securing the actuator to the cam switch cover bracket.
9. Cut the tie-wrap securing the actuator cable and drive lockout sensor cable to the rear of the tilt frame support.
10. Cut the tie-wraps securing the actuator cable and drive lockout sensor together.

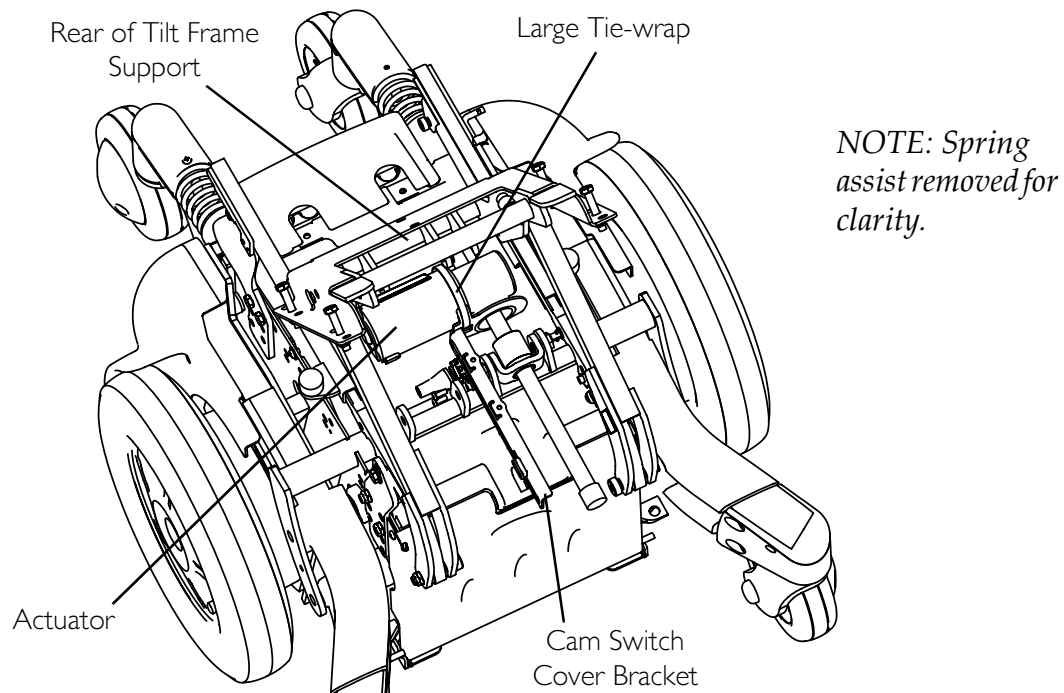


FIGURE 10.5 Preparing to Replace the Tilt Actuator / Preparing the Actuator for Use

Removing the Tilt Actuator

NOTE: For this procedure, refer to FIGURE 10.6 on page 112.

1. Remove the two cap screws securing the cam harness cable and cam switch cover to the tilt assembly (Detail "A").
2. Move the cam switch cover to the side.

⚠ WARNING

When both threaded pivot pins or the clevis pin are removed, the seat assembly will be unsupported by the tilt assembly. Ensure the seat assembly is supported from behind until the new actuator has the clevis pin and at least one threaded pivot pin installed. Otherwise, the seat assembly may fall backward and injury or damage may occur.

3. Ensure the seat assembly is supported from behind by an assistant or a stationary object.
4. Remove the threaded pivot pin securing the right side of the actuator to the front of the tilt frame (Detail "B").
5. Remove the threaded pivot pin securing the left side of the actuator to the front of the tilt frame (Detail "B").
6. Remove the cotter pin and washer from the clevis pin (Detail "C").
7. Remove the clevis pin securing the rear of the actuator to the tilt frame support (Detail "C").
8. Remove the actuator.

Installing the Tilt Actuator

NOTE: For this procedure, refer to FIGURE 10.6 on page 112.

1. Ensure the seat assembly is supported from behind by an assistant or a stationary object.
2. Position the new actuator as shown in FIGURE 10.6.
3. Insert the clevis pin to secure the rear of the actuator to the tilt frame support (Detail "C").
4. Install the washer onto the clevis pin (Detail "C").
5. Install the cotter pin through the clevis pin.
6. Install one threaded pivot pin to secure the left side of the actuator to the front of the tilt frame (Detail "B").

NOTE: The tilt frame should now be supported by the actuator.

7. Install the remaining threaded pivot pin to secure the right side of the actuator to the front of the tilt frame (Detail "B").
8. Position the cam switch cover onto the actuator as shown in FIGURE 10.6.
9. Secure the cam harness cable to the tilt assembly using the two cap screws (Detail "A"). Torque to 75 in-lbs \pm 20%.

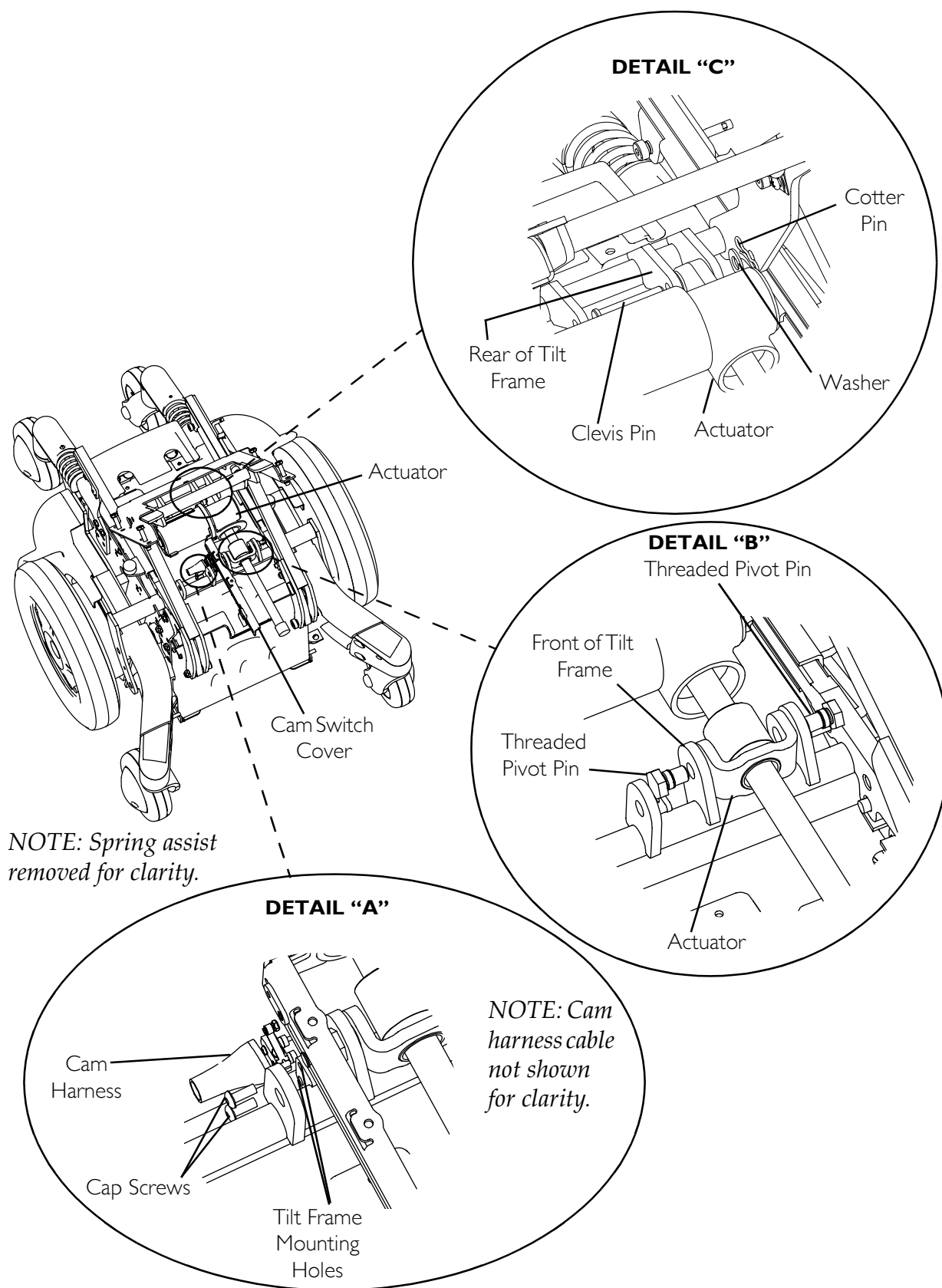


FIGURE 10.6 Removing the Tilt Actuator/Installing the Tilt Actuator

Preparing the Actuator for Use

NOTE: For this procedure, refer to FIGURE 10.5 on page 110.

1. Route the actuator cable towards the rear of the chair.
2. Tie-wrap the actuator cable to the drive lockout sensor cable.
3. Tie-wrap the drive lockout sensor cable and the actuator cable to the center of the rear tilt frame.
4. Tie-wrap the cam switch cover to the actuator using the large tie-wrap as shown in FIGURE 10.5.
5. Connect the actuator cable to the cam switch harness (YELLOW connector).
6. Install the rear shroud. Refer to the owner's manual listed in [Reference Documents](#) on page 13.
7. Install the actuator shroud. Refer to [Removing/Installing the Actuator Shroud](#) on page 108.
8. Install the seat pan. Refer to [Removing/Installing the Seat Pan](#) on page 84.
9. Connect the joystick.
10. Turn the joystick on.
11. Test the operation of the tilt system to ensure no cables are being pulled, crushed or damaged. If necessary, remove tie-wraps and reposition new tie-wraps to secure the cables and prevent damage.
12. Use the tilt function to return the seat to the down position.

Removing/Installing the Cam Switch Cover

NOTE: For this procedure, refer to FIGURE 10.7 on page 114.

Removing

1. Use the tilt function to tilt the seat back.
2. Remove the actuator shroud. Refer to [Removing/Installing the Actuator Shroud](#) on page 108.
3. Turn the joystick off.
4. Disconnect the joystick.
5. Remove the two cap screws securing the cam harness cable to the tilt assembly (Detail "A").
6. Cut the large tie-wrap securing the cam switch cover to the actuator.
7. Slide the cam harness cable to the front end of the cam switch cover (Detail "B").
8. Remove the pin from the large hole in the end of the cam switch cover.
9. Remove the cam switch cover.

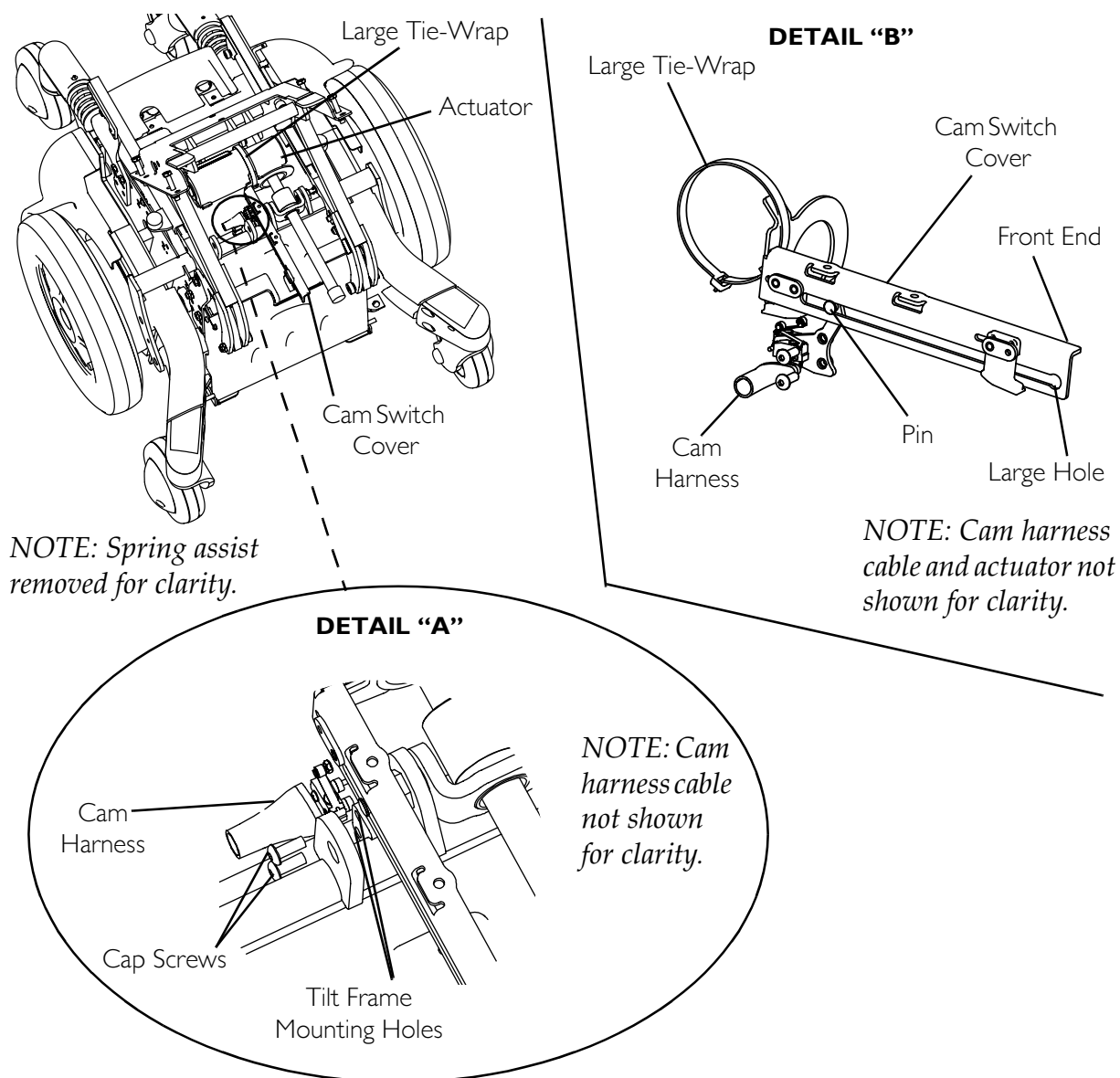


FIGURE 10.7 Removing/Installing the Cam Switch Cover/Removing/Installing the Cam Harness Cable

Installing

1. Position the cam switch cover as shown in FIGURE 10.7.
2. Insert the pin into the large hole in the end of the cam switch cover.
3. Slide the pin backward approximately 1 inch.
4. Align the cam harness cable mounting holes with the mounting holes in the tilt assembly (Detail "A").
5. Secure the cam harness cable to the tilt assembly using the two cap screws.
6. Tie-wrap the cam switch cover to the actuator using the large tie-wrap as shown in (Detail "B").

7. Install the actuator shroud. Refer to [Removing/Installing the Actuator Shroud](#) on page 108.
8. Connect the joystick.
9. Turn the joystick on.
10. Use the tilt function to return the seat to the down position.
11. Test the operation of the tilt system to ensure no cables are being pulled, crushed or damaged. If necessary, remove tie-wraps and reposition new tie-wraps to secure the cables and prevent damage.

Removing/Installing the Cam Harness Cable

NOTE: For this procedure, refer to FIGURE 10.7 on page 114.

Removing the Cam Harness Cable

1. Use the tilt function to tilt the seat back.
2. Remove the actuator shroud. Refer to [Removing/Installing the Actuator Shroud](#) on page 108.
3. Turn the joystick off.
4. Disconnect the joystick.
5. Remove the rear shroud from the wheelchair. Refer to the owner's manual listed in [Reference Documents](#) on page 13.
6. For proper installation, note the locations of the tie-wraps securing the cam harness cable.
7. Cut the tie-wraps securing the cam harness cable to the tilt assembly and/or any other cables.
8. Unplug the actuator from the cam harness cable (YELLOW connector).
9. Unplug the cam harness cable from the TRSS, SAC, TAC or controller harness (MK6i).
10. Remove the two cap screws securing the cam harness cable to the tilt assembly (Detail "A").
11. Slide the cam harness cable to the front end of the cam switch cover (Detail "B").
12. Remove the pin from the large hole in the end of the cam switch cover.
13. Remove the cam harness cable.

Installing the Cam Harness Cable

1. Insert the pin into the large hole in the end of the cam switch cover (Detail "B").
2. Slide the pin backward approximately one inch.

3. Align the cam harness cable mounting holes with the mounting holes in the tilt assembly (Detail “A”).
4. Secure the cam harness cable to the tilt assembly using the two cap screws.
5. Connect the cam harness cable to the actuator connector on the TRSS, SAC, TAC or controller harness (MK6i).
6. Tie-wrap the cam harness cable as noted in STEP 6 of Removing the Cam Harness Cable on page 115.
7. Install the actuator shroud. Refer to Removing/Installing the Actuator Shroud on page 108.
8. Connect the joystick.
9. Turn the joystick on.
10. Use the tilt function to return the seat to the down position.
11. Test the operation of the tilt system to ensure no cables are being pulled, crushed or damaged. If necessary, remove tie-wraps and reposition new tie-wraps to secure the cables and prevent damage.

Removing/Installing the Spring Assist Assembly

⚠ WARNING

DO NOT install the spring assist assembly onto M7I wheelchairs. This option is for M9I and TDX wheelchairs only. Otherwise, injury or damage may occur.

NOTE: For this procedure, refer to FIGURE 10.8 on page 118.

Removing

1. Remove the seat pan. Refer to Removing/Installing the Seat Pan on page 84.
2. Remove the actuator shroud. Refer to Removing/Installing the Actuator Shroud on page 108.
3. If possible, use the tilt function to tilt the seat back to at least 20°.
4. Turn the joystick off.
5. Disconnect the joystick.
6. Examine the spring retainer and the spring assist assembly for damage. If damaged, DO NOT reinstall these parts. Contact Invacare to order replacements for these parts.
7. Remove the Mounting screw securing the spring retainer to the spring assist assembly (Detail “A”).
8. Unthread the spring retainer to remove it from the spring assist.

⚠ **WARNING**

Use EXTREME caution, and work very slowly when loosening the locknut on the end of the spring. Otherwise, the spring will expand rapidly and injury or damage may occur

The spring must be fully expanded before removing the spring assist assembly. Otherwise, injury or damage may occur.

9. Using EXTREME caution, SLOWLY loosen the locknut on the end of the spring until the spring is fully expanded (Detail "A").

NOTE: The spring is fully expanded when the locknut reaches the end of the threads.

10. Remove the two threaded pivot pins securing the front of the spring assist assembly to the tilt frame (Detail "A").
11. Remove the cotter pin from the clevis pin at the rear of the spring assist assembly (Detail "B").
12. Remove the clevis pin securing the rear of the spring assist assembly to the tilt frame (Detail "B").
13. Remove the spring assist assembly from the tilt frame.

Installing

1. Position the spring assist assembly onto the tilt frame as shown in FIGURE 10.8.
2. Install the clevis pin to secure the rear of the spring assist assembly to the tilt frame (Detail "B").

NOTE: The clevis pin should be installed with the head to the right side.

3. Install the washer onto the clevis pin (Detail "B").
4. Install the cotter pin through the clevis pin to secure the clevis pin (Detail "B").
5. Install the two threaded pivot pins to secure the front of the spring assist assembly to the tilt frame (Detail "A").
6. Tighten the locknut to 13 ft-lbs \pm 20%.
7. Install the spring retainer onto the threads of the spring assist.
8. Secure the spring retainer to the spring assist using the Mounting screw.
9. Install the actuator shroud. Refer to Removing/Installing the Actuator Shroud on page 108.
10. Install the seat pan. Refer to Removing/Installing the Seat Pan on page 84.
11. Connect the joystick.

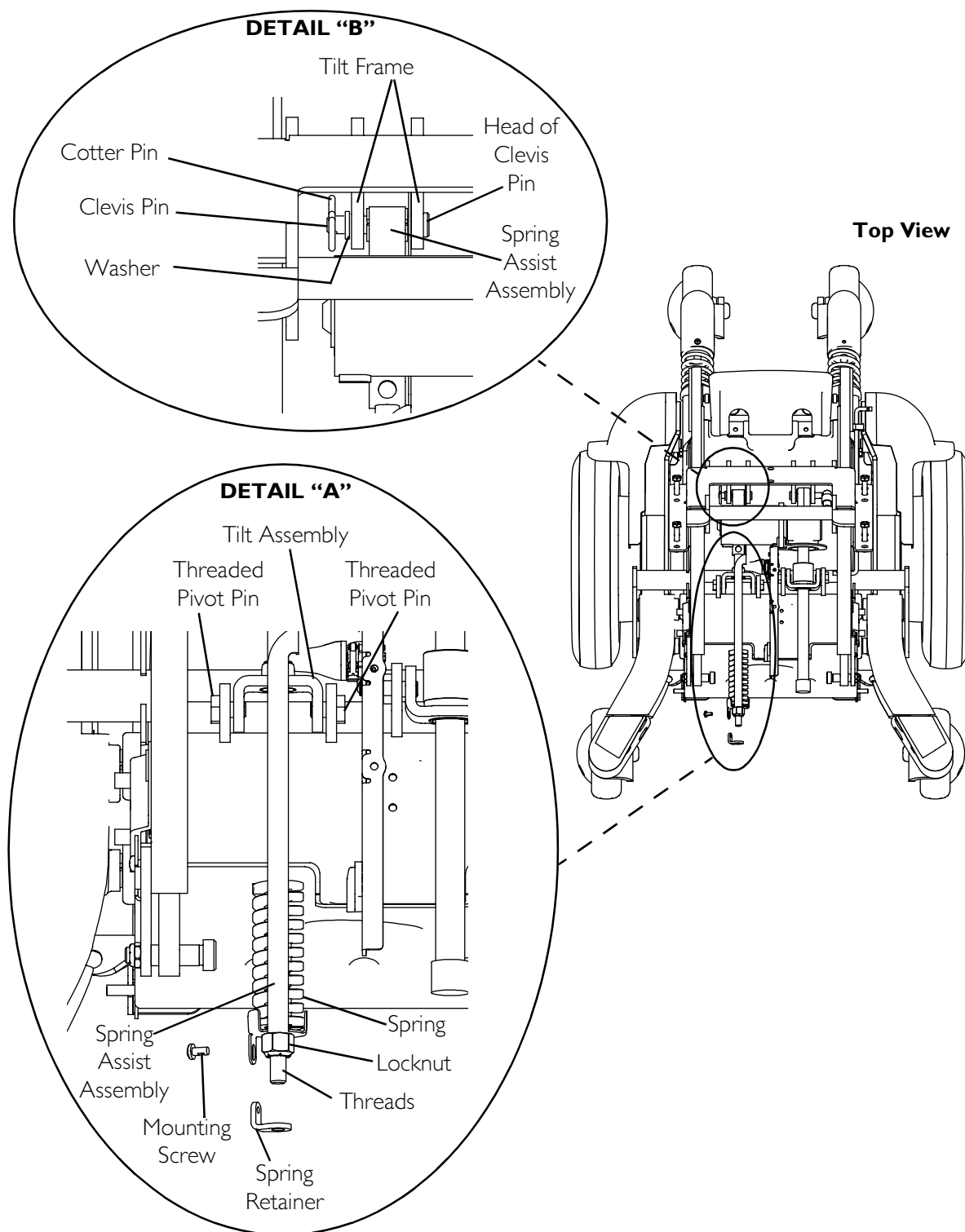


FIGURE 10.8 Removing/Installing the Spring Assist Assembly

SECTION 11—MK6i ELECTRONICS

⚠ WARNING

After any adjustments, repair or service and before use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

Before performing any maintenance, adjustments or service, always turn the wheelchair power off, otherwise injury or damage may result.

Cables **MUST** be secured to the wheelchair frame and/or base with tie-wraps after servicing is complete. Failure to follow the warnings and instructions below could result in injury to the users, attendants and/or bystanders and/or damage to the wheelchair.

Cables **MUST** be secured so there are no loops of excess cable extending away from the wheelchair. Bundle all excess cable together and secure with a tie-wrap. It may also be necessary to secure these bundles to the frame and/or base.

ALWAYS test all wheelchair functions after securing the cables to be sure cables **DO NOT** get pinched, crushed or pulled during operation of the wheelchair.

Connecting/Disconnecting Network Connectors

⚠ WARNING

The controller network connector **MUST** be positioned at the end of the series of network connectors. The bottom connector cap **MUST** be installed. Otherwise, injury may occur due to contact with the exposed pins on the controller network connector.

NEVER allow tools to contact the pins on the controller network connector. Otherwise, injury or damage may occur.

The top connector cap and gasket **MUST** be installed to protect the network connectors from dirt, debris or contamination. Otherwise, the wheelchair may not function properly.

NOTE: For this procedure, refer to FIGURE 11.1 on page 121.

NOTE: Most MK6i components connect to form a network. Use this procedure to connect/disconnect cables that have network connectors.

Disconnecting

1. Pull the latch away from the network connector.
2. Disconnect the desired connector from the remaining connectors.

Connecting

1. Ensure the latch is pulled away from the network connector.
2. Connect the network connector to the other connectors.
3. Top and Bottom Connectors - Install connector caps onto the network connector.

NOTE: Ensure the gasket is installed in the top connector cap.

4. Push the latch in to secure the network connectors and caps.
5. If necessary secure excess cable using tie-wraps.

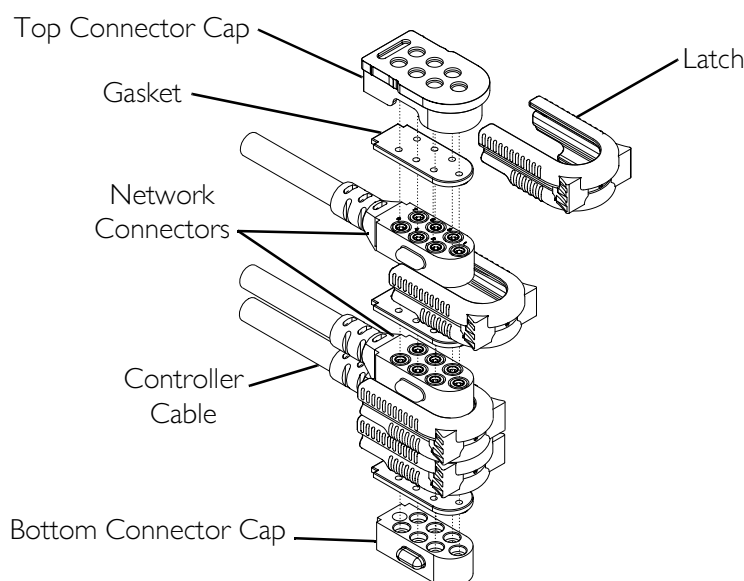


FIGURE 11.1 Connecting/Disconnecting Network Connectors

Replacing the Drive Lockout Sensor

NOTE: For this procedure, refer to FIGURE 11.2 on page 122.

1. Loosen, but DO NOT remove, the mounting screw securing the drive lockout clamp to the tilt assembly.
2. Remove the drive lockout sensor from the drive lockout clamp.
3. Unplug the drive lockout sensor from the controller harness.
4. For proper installation, note the location of any tie-wraps securing the drive lockout sensor cable to the wheelchair.
5. Remove any tie-wraps securing the drive lockout sensor cable to the wheelchair.
6. Position the new drive lockout sensor in the drive lockout clamp.
7. Tighten the mounting screw loosened in STEP 1.
8. Plug the drive lockout sensor into the controller harness 3-pin Molex connector.

- Secure the drive lockout sensor cable to the wheelchair with tie-wraps, making sure there is no excess cable which loops away from the wheelchair. Refer to Securing the Cables on page 145 for more information about properly securing the cables.

NOTE: Ensure the cables are secured in the locations noted in STEP 4.

- Adjust the drive lockout sensor. Refer to Adjusting the Drive Lockout Sensor on page 122.

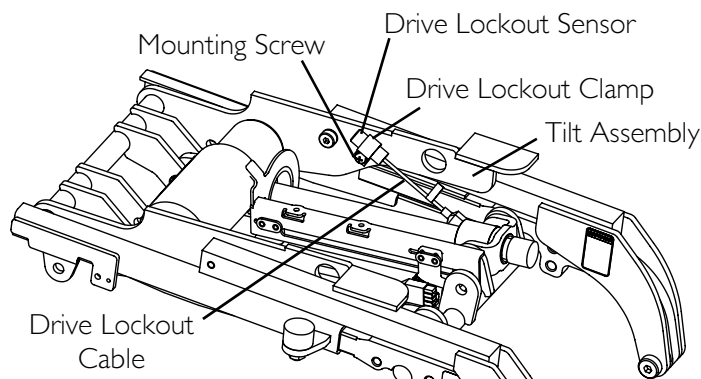


FIGURE 11.2 Replacing the Drive Lockout Sensor / Adjusting the Drive Lockout Sensor

Adjusting the Drive Lockout Sensor

NOTE: For this procedure, refer to FIGURE 11.2 on page 122.

- Tilt the seating system until the joystick indicates drive lockout:
 - MK6i MPJ+ Joysticks - ⚠ TILT WARNING or ⚠ SPM Inhibited displays on the joystick or display unit.
 - SPJ+ Joysticks - Left to right chase alternating with a steady display.
- Loosen the mounting screw securing the drive lockout sensor clamp to the tilt assembly.
- Slowly move the drive lockout sensor in the following manner:
 - Towards the Front of the Wheelchair - Decreases drive lockout angle.
 - Towards the Rear of the Wheelchair - Increases drive lockout angle.
- Tighten the mounting screw to secure the drive lockout sensor in the desired position.

⚠ **WARNING**

NEVER operate the wheelchair while the seat is in any seat angle position over 20° **RELATIVE TO THE HORIZONTAL SEAT POSITION**. Drive lockout **MUST** not be adjusted beyond 20°.

The wheelchair user **MUST** have a clear line of sight to drive safely. On initial chair delivery and after adjusting the back angle, drive lockout switch or tilt system, tilt the seat back to the farthest driving position **IMMEDIATELY** before drive lockout engages and ensure there is a clear line of sight present in which to drive the wheelchair. If a clear line of sight is not present, have the back angle repositioned or readjust the lockout angle such that safe driving with a clear line of sight is achieved. Otherwise injury or damage may occur.

5. Repeat STEP 1 to determine if the adjustment achieved the desired drive lockout angle.
6. Perform one of the following:
 - Drive Lockout Angle is Correct - Proceed to STEP 7.
 - Drive Lockout Angle is Incorrect - Repeat STEPS 1-5 until the drive lockout angle is correct.
7. Test the tilt function and ensure the drive lockout works at no more than 20° of tilt.

Adjusting/Replacing the Tilt Sensor

The cam switch harness contains the tilt sensor. There is no adjustment to this switch. Refer to Removing/Installing the Cam Harness Cable on page 115 for replacement instructions.

Removing/Installing the Sanode

NOTE: For this procedure, refer to FIGURE 11.3 on page 124.

NOTE: Use the sanode to operate the single actuator seating system using the Mk6i MPJ+ joystick.

Removing

1. Remove the tie-wraps securing the sanode and cable to the wheelchair.
2. Disconnect the network connector. Refer to Connecting/Disconnecting Network Connectors on page 120.

Installing

1. Connect the network connector. Refer to Connecting/Disconnecting Network Connectors on page 120.
2. Secure the sanode to the powered seating system using tie-wraps.

NOTE: Secure the sanode in a location that will enable the powered seating system to function without pulling, crushing or pinching the cable.

3. If adding the sanode to the seating system, further programming in the POWERED SEATING menu is necessary to allow the joystick to operate the powered seating functions:
 - ACTUATOR CONTROL - needs to be set to 4-switch or other desired mode.
 - ACTUATOR SELECTION - needs to be set to the desired actuator controls for each joystick direction.

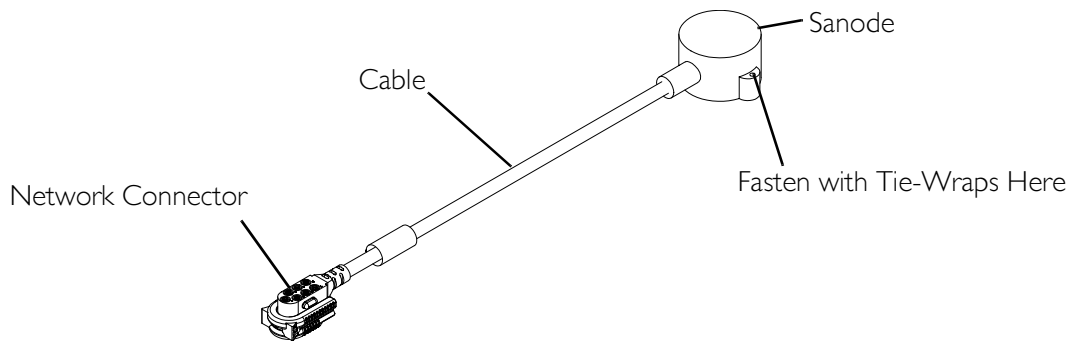


FIGURE 11.3 Removing/Installing the Sanode

Removing/Installing the 4-Way Switch Box (4WSB)

NOTE: For this procedure, refer to FIGURE 11.4 on page 125.

NOTE: Use the 4-way switch box to operate the seating system with multiple actuators (power legs, for example) using a 4-way toggle switch (FWT) or quad push button (QPB).

Removing

1. Loosen, but DO NOT remove, the two hex screws securing the mounting plate to the half clamps.
2. Remove the half clamps from the armrest.
3. Remove the two mounting screws securing the 4-way switch box to the mounting plate.
4. Remove any tie-wraps (not shown) securing the cable to the powered seating system.
5. Disconnect the network connector. Refer to Connecting/Disconnecting Network Connectors on page 120.

Installing

1. Secure the 4-way switch box to the mounting plate using the two mounting screws.
2. Tighten the two hex screws to secure the mounting plate to the half clamps and the half clamps to the armrest.

3. Connect the network connector. Refer to Connecting/Disconnecting Network Connectors on page 120.
4. Secure the cable to the powered seating system using tie-wraps.
5. Install the 4-way toggle switch or quad push button, if desired. Refer to Removing/Installing the 4-Way Toggle Switch (FWT) on page 125 or Removing/Installing the Quad Push Button (QPB) on page 126.
6. Test the seating system function to ensure the cable is not pulled, crushed or pinched.
7. If adding the 4-way switch box to the seating system, further programming in the CALIBRATION menu is necessary to allow the 4-way toggle switch to operate the powered seating functions:
 - 4-WAY SWITCH - needs to be set to the desired actuator controls for each direction.

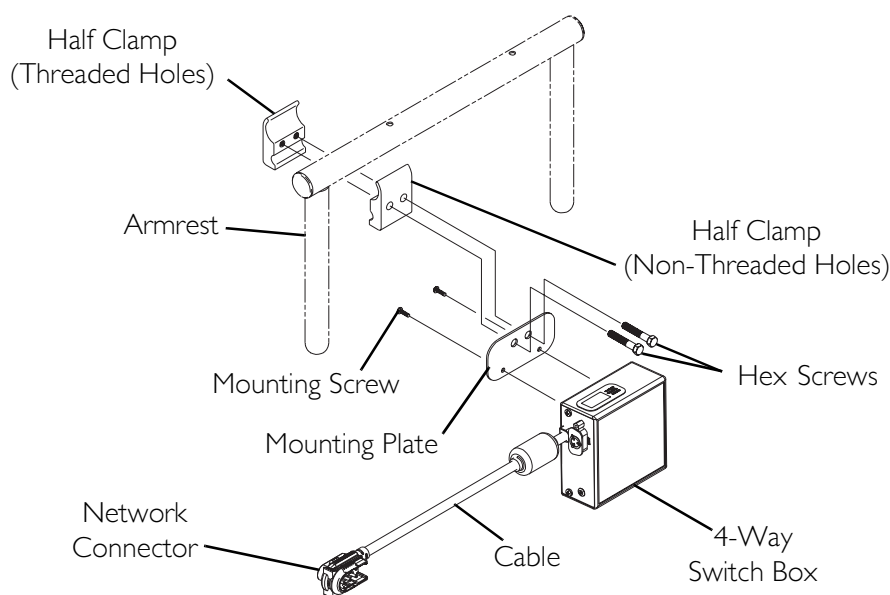


FIGURE 11.4 Removing/Installing the 4-Way Switch Box (4WSB)

Removing/Installing the 4-Way Toggle Switch (FWT)

NOTE: For this procedure, refer to FIGURE 11.5 on page 126.

NOTE: The 4-way switch box must be installed to use the 4-way toggle switch to operate the powered seating system. Refer to Removing/Installing the 4-Way Switch Box (4WSB) on page 124.

Removing

1. Loosen, but DO NOT remove, the two hex screws securing the joystick mounting bracket to the half clamps.
2. Remove the two mounting screws and washers that secure the 4-way toggle switch to the joystick mounting bracket.
3. Disconnect the connector from the 4-way switch box (not shown).

4. Remove any tie-wraps securing the cable to the powered seating system.

Installing

1. Secure the 4-way toggle switch to the joystick mounting bracket using the two mounting screws and washers.
2. Tighten the two hex screws to secure the joystick mounting bracket to the half clamps and the half clamps to the joystick mounting tube (not shown).
3. Connect the connector to the 4-way switch box.
4. Secure the cable to the powered seating system using tie-wraps.
5. Test the seating system function to ensure the cable is not pulled, crushed or pinched.

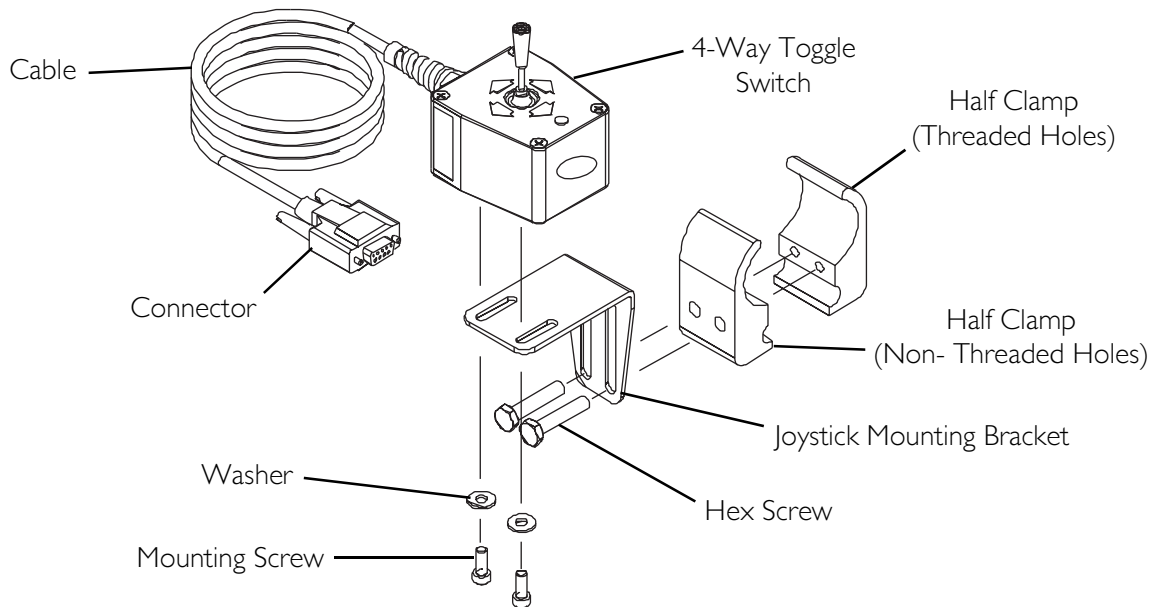


FIGURE 11.5 Removing/Installing the 4-Way Toggle Switch (FWT)

Removing/Installing the Quad Push Button (QPB)

NOTE: For this procedure, refer to FIGURE 11.6 on page 127.

NOTE: The 4-way switch box must be installed to use the quad push button to operate the powered seating system. Refer to Removing/Installing the 4-Way Switch Box (4WSB) on page 124.

Removing

1. Disconnect the connector from the 4-way switch box (not shown).
2. Remove any tie-wraps securing the cable to the powered seating system.
3. Remove the quad push button from the powered seating system.

Installing

1. Connect the connector to the 4-way switch box.
2. Secure the quad push button to the powered seating system in the desired location.
3. Secure the cable to the powered seating system using tie-wraps.
4. Test the seating system function to ensure the cable is not pulled, crushed or pinched.

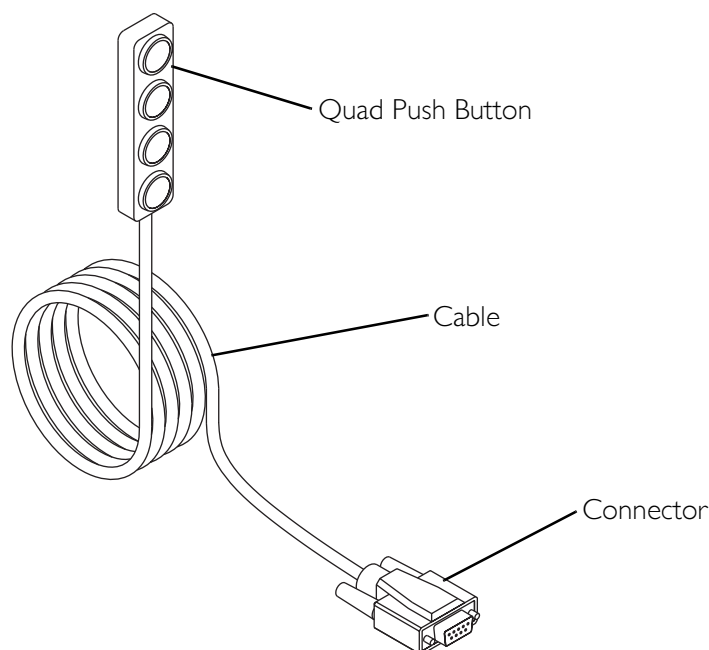


FIGURE 11.6 Removing/Installing the Quad Push Button (QPB)

Removing/Installing the Multiple Actuator Interface Box (S4WSB)

NOTE: For this procedure, refer to FIGURE 11.7 on page 128.

NOTE: Use the multiple actuator interface box to operate the seating system with multiple actuators (power legs, for example) using the MPJ+ joystick and also a 4-way toggle switch or quad push button.

Removing

1. Loosen, but do not remove, the two hex screws securing the mounting plate to the half clamps.
2. Remove the half clamps from the armrest.
3. Remove the two mounting screws securing the multiple actuator interface box to the mounting plate.
4. Remove any tie-wraps (not shown) securing the cable to the powered seating system.

5. Disconnect the network connector. Refer to [Connecting/Disconnecting Network Connectors](#) on page 120.

Installing

1. Secure the multiple actuator interface box to the mounting plate using the two mounting screws.
2. Tighten the two hex screws to secure the mounting plate to the half clamps and the half clamps to the armrest.
3. Connect the network connector. Refer to [Connecting/Disconnecting Network Connectors](#) on page 120
4. Secure the cable to the powered seating system using tie-wraps.
5. Test the seating system function to ensure the cable is not pulled, crushed or pinched.
6. If adding the multiple actuator interface box to the seating system, further programming is necessary to allow the joystick or the 4-way toggle switch to operate the powered seating functions:
 - CALIBRATIONS menu - 4-WAY SWITCH - needs to be set to the desired actuator controls for each direction.
 - POWERED SEATING menu - ACTUATOR CONTROL and ACTUATOR SELECTION need to be set.

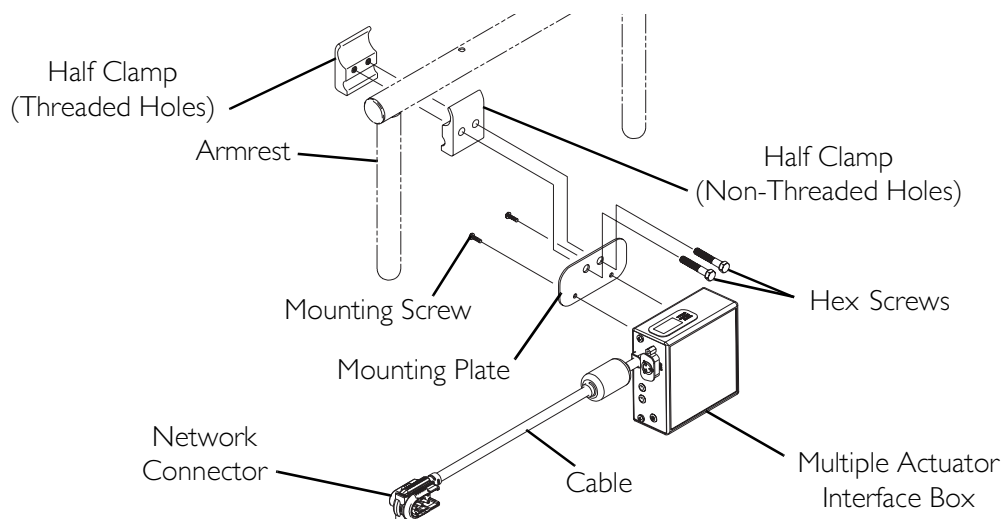


FIGURE 11.7 Removing/Installing the Multiple Actuator Interface Box (S4WSB)

Removing/Installing the Dual Leg Integrated Actuator Module (DLIAM)

NOTE: For this procedure, refer to FIGURE 11.8.

NOTE: Use the DLIAM when powered elevating legrests (ELRPW) are installed on the seating system.

Removing

1. Remove the two mounting screws securing the DLIAM to the seat pan.
2. Remove any tie-wraps securing the DLIAM cables to the powered seating system.
3. Disconnect the power elevating legrest harness connector.
4. Disconnect the network connector. Refer to Connecting/Disconnecting Network Connectors on page 120.

Installing

1. Secure the DLIAM to the seat pan using the two mounting screws.
2. Connect the power elevating legrest harness connector.
3. Connect the network connector. Refer to Connecting/Disconnecting Network Connectors on page 120.
4. Secure the cables to the powered seating system using tie-wraps.
5. Test the seating system function to ensure the cables are not pulled, crushed or pinched.
6. If adding the DLIAM to the seating system, further programming is necessary to allow the joystick or 4-way toggle switch to operate the powered legs:
 - CALIBRATIONS menu - 4-WAY SWITCH - needs to be set to the desired actuator controls for each direction on the 4-way toggle switch.
 - POWERED SEATING menu - ACTUATOR SELECTION need to be set for each joystick direction.

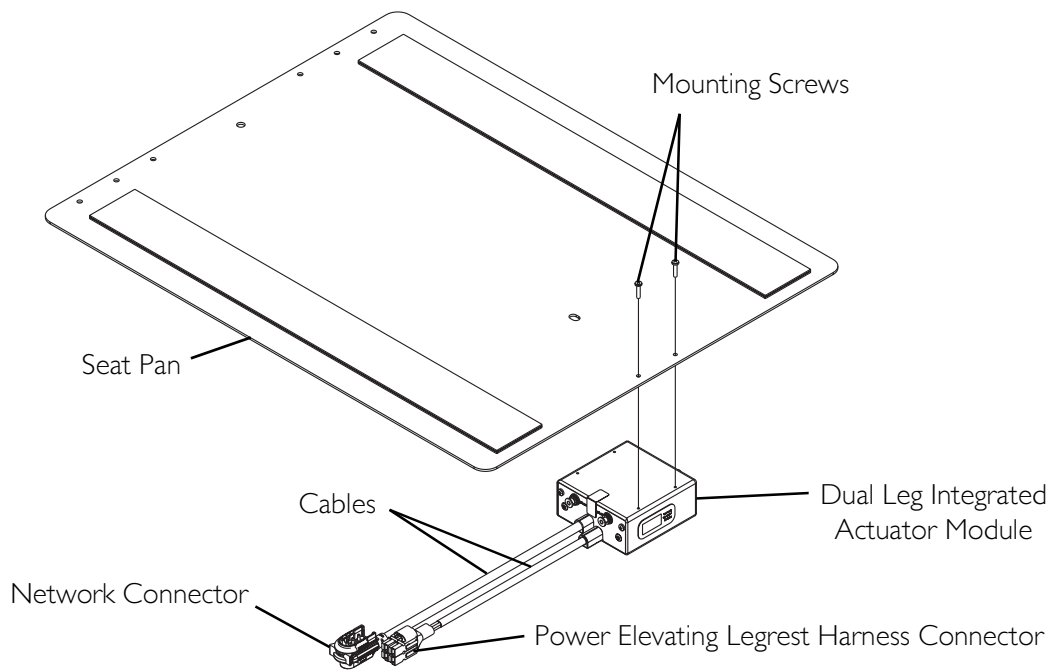


FIGURE 11.8 Removing/Installing the Dual Leg Integrated Actuator Module (DLIAM)

SECTION 12—MK₅ ELECTRONICS

⚠ WARNING

After any adjustments, repair or service and before use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

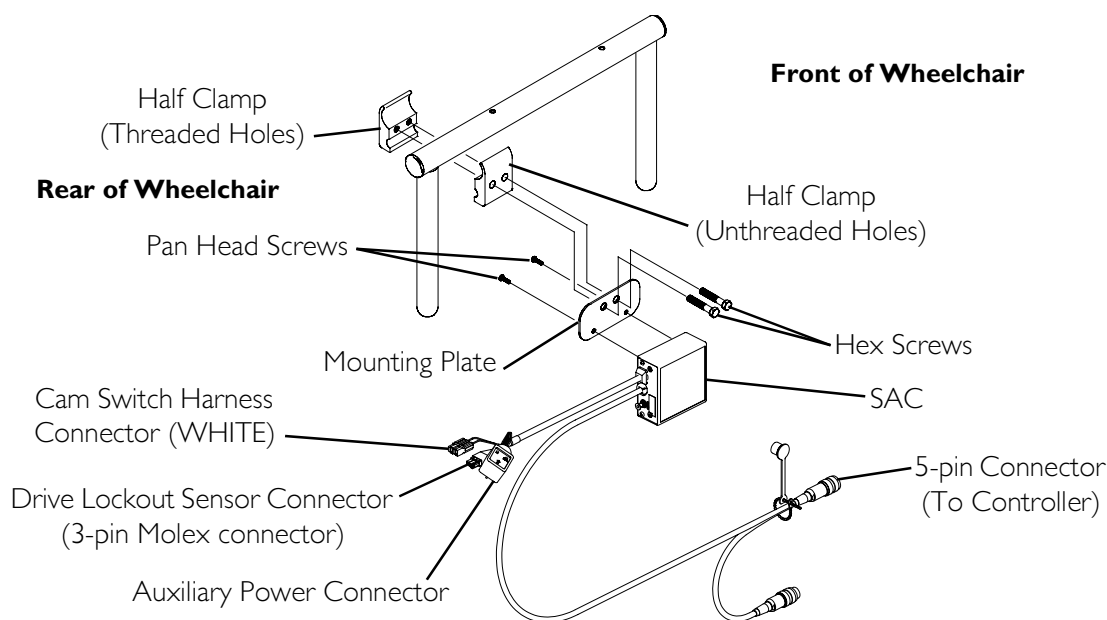
Before performing any maintenance, adjustments or service, always turn the wheelchair power off, otherwise injury or damage may result.

Replacing the SAC

NOTE: For this procedure, refer to FIGURE 12.1 on page 132.

NOTE: Reverse this procedure to install the SAC. Ensure the cables are toward the rear of the wheelchair and secure them as described in Securing the Cables on page 145.

1. Use the tilt function to tilt the seat back to 20° to 25°. Refer to Operating the Powered Tilt System on page 104.
2. Turn the joystick off.
3. Disconnect the joystick.
4. Tilt the PTO Plus back. Refer to Tilting the Seat Assembly on page 82.
5. Remove the shroud listed below from the wheelchair. Refer to the owner's manual listed in Reference Documents on page 13.
 - TDX Wheelchairs - Remove the rear shroud.
 - M71 and M91 Wheelchairs - Remove the front shroud.
6. Disconnect the PTO Plus auxiliary power connector from the power take-off connector of the MK5 controller.
7. Disconnect the cam switch harness (WHITE connector).
8. Disconnect the drive lockout sensor (3-pin Molex connector).
9. Disconnect the 5-pin connector from the MK5 controller.
10. For proper installation, note the location of any tie-wraps securing the SAC cables to the wheelchair.
11. Cut the tie-wraps securing the SAC cables to the wheelchair.
12. Remove the two pan head screws securing the SAC to the mounting plate.
13. Remove the two hex screws securing the half clamps to the wheelchair frame.
14. Remove the half clamps from the wheelchair frame.

**FIGURE 12.1** Replacing the SAC

Replacing the TRSS

NOTE: For this procedure, refer to FIGURE 12.2 on page 133.

NOTE: Reverse this procedure to install the TRSS. Ensure the cables are secured as described in Securing the Cables on page 145.

1. Use the tilt function to tilt the seat back to 20° to 25°. Refer to Operating the Powered Tilt System on page 104.
2. Turn the joystick off.
3. Disconnect the joystick.
4. Tilt the PTO Plus back. Refer to Tilting the Seat Assembly on page 82.
5. Remove the shroud listed below from the wheelchair. Refer to the owner's manual listed in Reference Documents on page 13.
 - TDX Wheelchairs - Remove the rear shroud.
 - M71 and M91 Wheelchairs - Remove the front shroud.
6. Disconnect the PTO Plus auxiliary power connector from the power take-off connector of the MK5 controller.
7. Disconnect the cam switch harness (WHITE connector).
8. Disconnect the drive lockout sensor (3-pin Molex connector).
9. For proper installation, note the location of any tie-wraps securing TRSS cables.
10. Cut the tie-wraps securing TRSS cables.
11. Remove the two button head screws securing the TRSS to the mounting bracket.

12. Remove the TRSS from the mounting bracket.
13. If desired, loosen the two socket screws securing the mounting bracket to the joystick mounting tube.
14. Slide the mounting bracket off the joystick mounting tube.

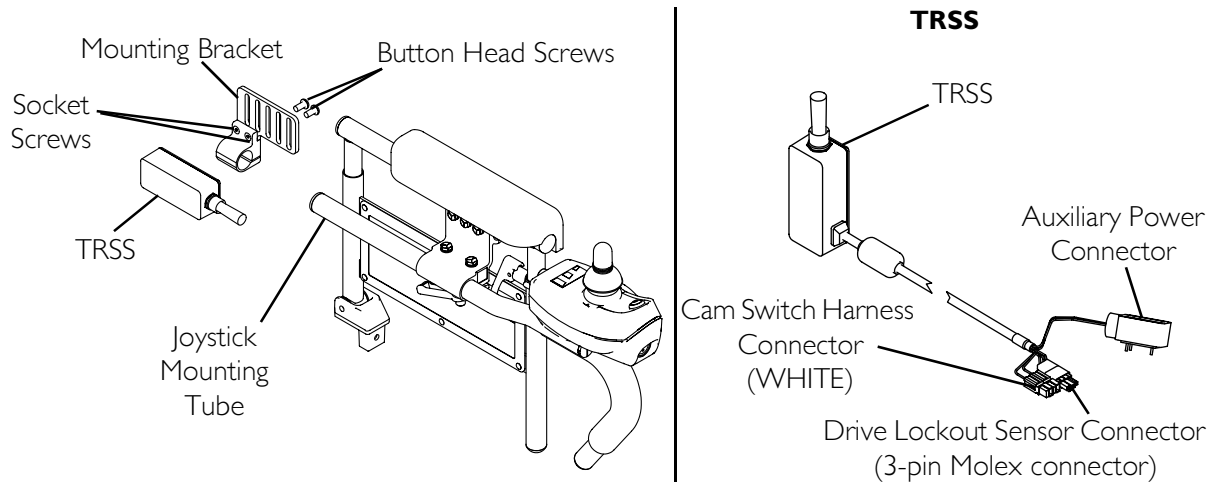


FIGURE 12.2 Replacing the TRSS

Replacing the TRECM or TAC

NOTE: For this procedure, refer to FIGURE 12.3 on page 134 and FIGURE 12.4 on page 135.

NOTE: Reverse this procedure to install the TRECM or TAC. Ensure the cables are secured as described in [Securing the Cables](#) on page 145.

NOTE: The TRECM can only be installed on TDX wheelchairs.

NOTE: If installing a TAC onto a system that previously had a TRSS or SAC, the TAC must be programmed after installation. Refer to [Programming the TAC](#) on page 144.

1. Use the tilt function to tilt the seat back to 20° to 25°. Refer to [Operating the Powered Tilt System](#) on page 104.
2. Turn the joystick off.
3. Disconnect the joystick.
4. Tilt the PTO Plus back. Refer to [Tilting the Seat Assembly](#) on page 82.
5. Remove the shroud listed below from the wheelchair. Refer to the owner's manual listed in [Reference Documents](#) on page 13.
 - TDX Wheelchairs - Remove the rear shroud.
 - M71 and M91 Wheelchairs - Remove the front shroud.
6. Disconnect the PTO Plus auxiliary power connector from the power take-off connector of the MK5 controller (FIGURE 12.4).
7. Disconnect the cam switch harness (WHITE connector).

8. Disconnect the PTO Plus drive lockout sensor from the 3-pin Molex connector marked Tilt (TAC) or marked D/L (TRECM).
9. Disconnect the PTO Plus tilt sensor from the 3-pin Molex connector marked Recline (TAC) or marked tilt (TRECM).
10. Disconnect the 5-pin connector from the MK5 controller.
11. For proper installation, note the location of any tie-wraps securing the TRECM or TAC cables to the wheelchair.
12. Cut the tie-wraps securing the TRECM or TAC cables to the wheelchair.
13. Remove the two pan head screws securing the TRECM or TAC to the mounting bracket (FIGURE 12.3).
14. Perform one of the following:
 - Systems Manufactured Before 1/17/2005 - Loosen the two hex screws securing the controller bracket to the half clamps.
 - Systems Manufactured After 1/16/2005 - Loosen the four hex screws securing the standoffs to the half clamps.
15. Remove the controller bracket and half clamps from the back cane (DETAIL "A").

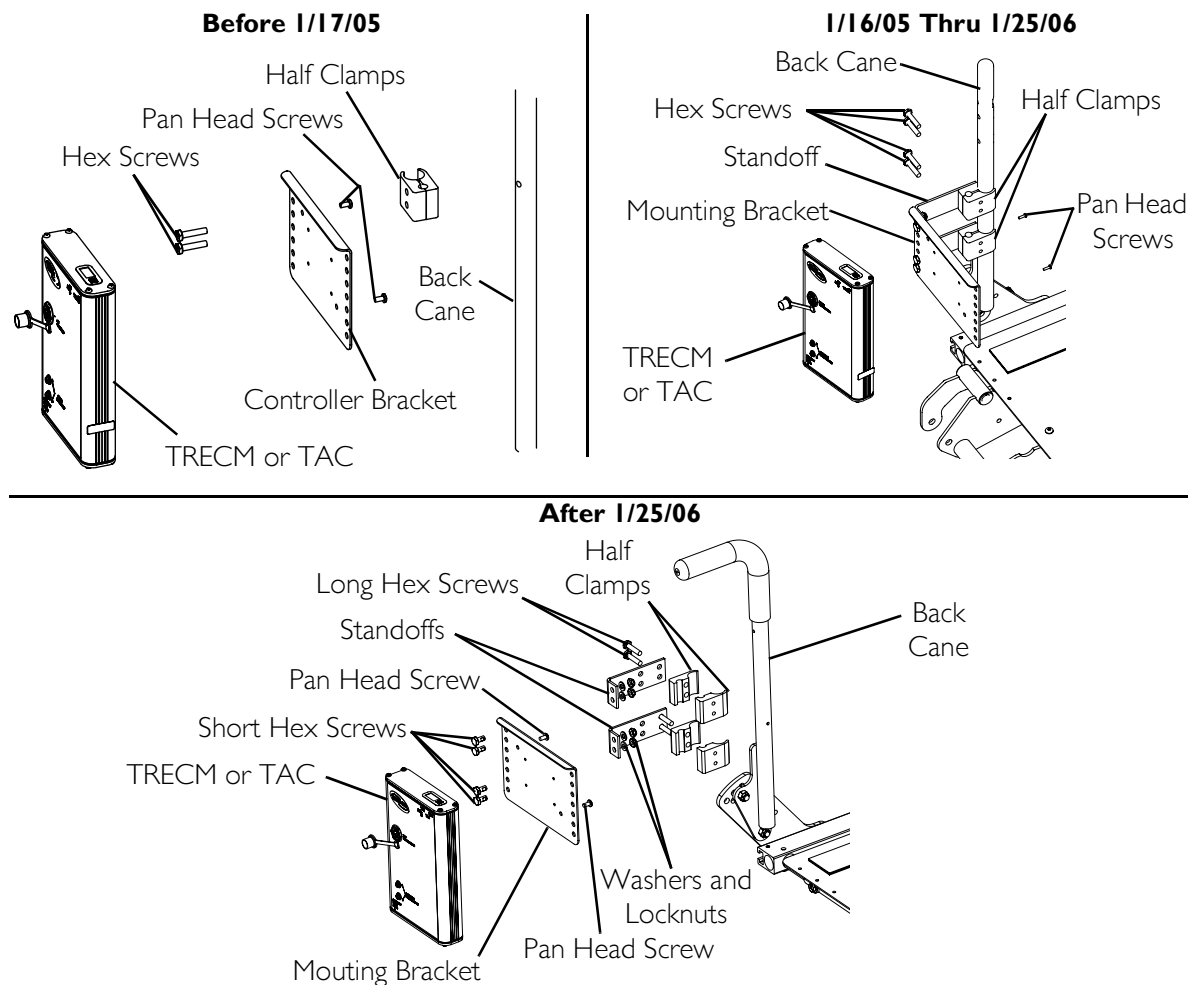
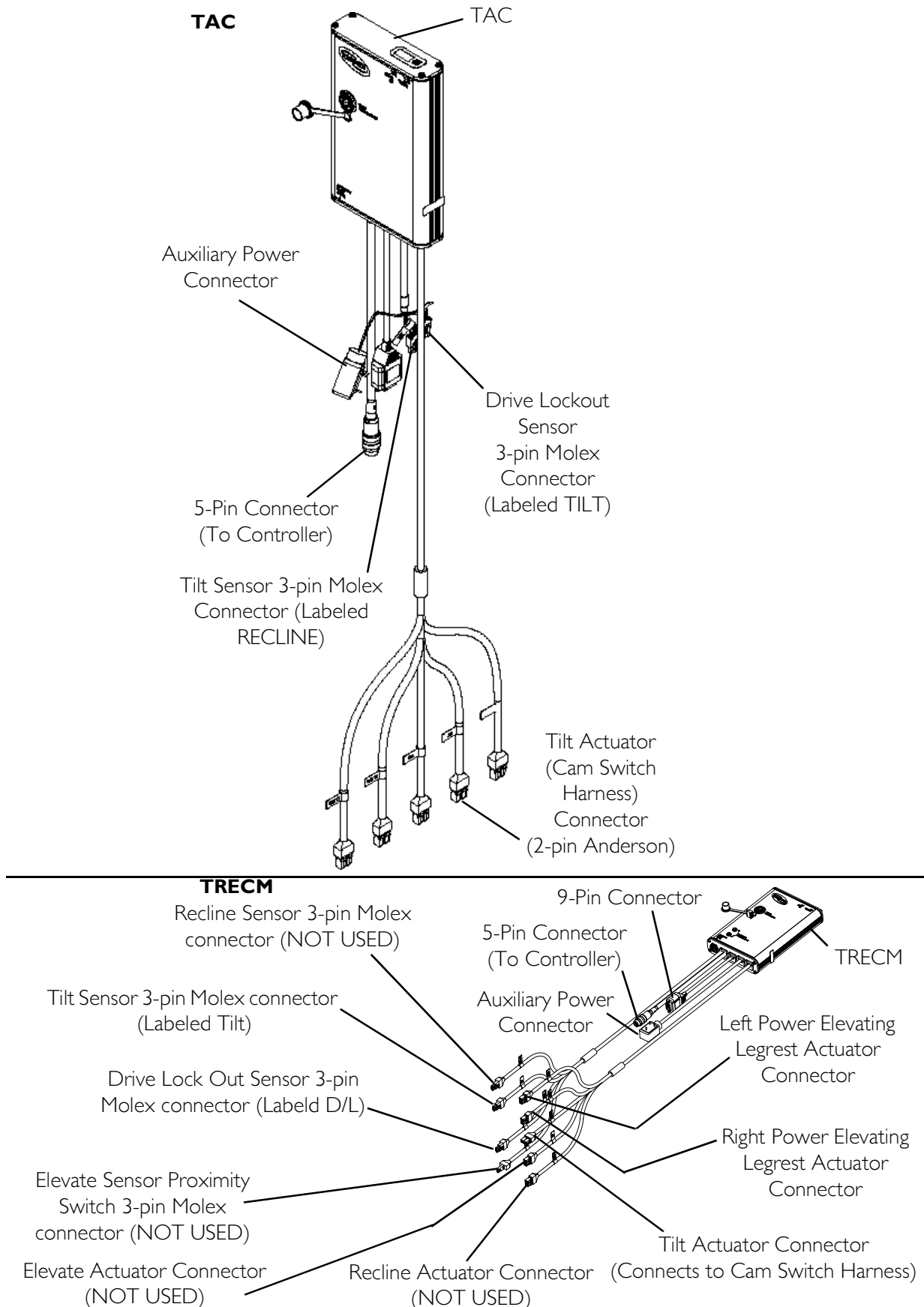


FIGURE 12.3 Replacing the TRECM or TAC - Mounting Brackets

**FIGURE 12.4** Replacing the TRECM or TAC

Adjusting/Replacing the Drive Lockout Sensor

⚠ WARNING

NEVER operate the wheelchair while in any tilted/back angle position over 20° **RELATIVE TO THE HORIZONTAL SEAT POSITION**. Drive lockout **MUST** not be adjusted beyond 20°.

Read and understand A Note About Drive Lock-Out on page 103 BEFORE performing this procedure.

Adjusting the Drive Lockout Sensor for TRSS, TRECM or TAC

NOTE: For this procedure, refer to FIGURE 12.7 on page 141.

1. Tilt the seating system to the desired drive lockout limit angle below 20° relative to the horizontal seat position.
2. Disconnect the actuator cable (2-pin Anderson connector) from the TRSS, TRECM or TAC.
3. Perform one of the following:
 - TRECM or TAC Only - Plug the remote programmer into the open circular 5-pin accessory connector on the bottom of the TRECM or TAC controller.
 - TRSS - Proceed to STEP 5.
4. TRECM and TAC Only - Perform the following steps:
 - A. Select ADVANCED MENU on the remote programmer.
 - B. Select CURRENT STATUS MENU.
 - C. Scroll down to DRIVE LOCKOUT.
5. Loosen the mounting screw securing the drive lockout clamp to the tilt assembly.
6. Perform one of the following:
 - TRECM or TAC - Perform the following steps:
 - i. Connect an ability switch to the A (phono jack) input of the TRECM or TAC.
 - ii. Press and release the switch to issue a command to the TRECM or TAC.
 - TRSS - Push the toggle of the TRSS in any direction.
7. Slowly move the drive lockout clamp in the following manner until the programmer changes from FALSE (OPEN) to TRUE (TRECM or TAC) or the drive lockout light illuminates (TRSS):
 - Towards the front of the wheelchair - Decreases the drive lockout angle.
 - Towards the rear of the wheelchair - Increases the drive lockout angle.

NOTE: TRECM or TAC Only - The ability switch must be pressed and released between each movement of the drive lockout sensor to update the status displayed on the remote programmer.

8. Tighten the mounting screw to secure the drive lockout clamp in the desired position.

⚠ WARNING

NEVER operate the wheelchair while in any tilted/back angle position over 20° **RELATIVE TO THE HORIZONTAL SEAT POSITION**. Drive lockout **MUST** not be adjusted beyond 20°.

The wheelchair user **MUST** have a clear line of sight to drive safely. On initial chair delivery and after adjusting the back angle, drive lock-out switch or tilt system, tilt the seat back to the farthest driving position immediately before drive lock-out engages and ensure there is a clear line of sight present in which to drive the wheelchair. If a clear line of sight is not present, have the back angle repositioned or readjust the lockout angle such that safe driving with a clear line of sight is achieved. **Otherwise injury or damage may occur.**

9. Test the up/down tilt functions.

10. Verify that drive lockout activates at or beyond 20° of tilt.

NOTE: When drive lockout activates, the wheelchair should not drive and you should get an error code (E28 or a series of flashing bars) on the joystick.

11. If drive lockout does not activate, repeat STEPS 1-10.

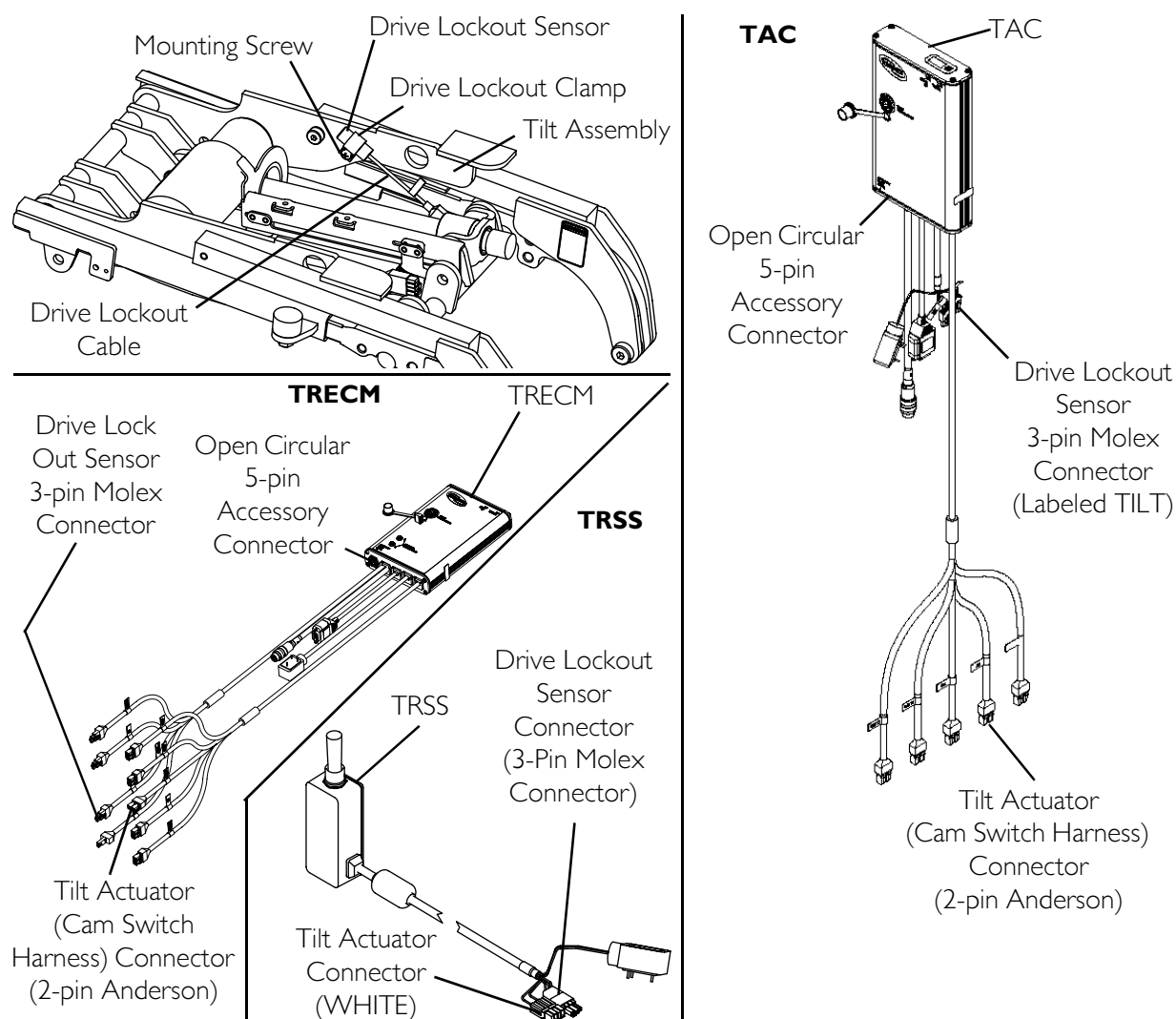


FIGURE 12.5 Adjusting the Drive Lockout Sensor for TRSS, TRECM or TAC

Adjusting the Drive Lockout Sensor for SAC

NOTE: For this procedure, refer to FIGURE 12.6 on page 139.

1. Turn the joystick On.
2. Use the tilt function to tilt the seating system to 20°. Refer to Operating the Powered Tilt System on page 104.

NOTE: Use a magnetic angle protractor to verify the seat angle.

3. Plug a reset switch directly into the 1/8-inch photo port on the SAC.
4. Disconnect the tilt actuator connector (2-pin Anderson) from the SAC.
5. Set up your digital multimeter for DC volts.
6. Locate pins 2 and 3 on the charger port.
7. Plug the negative (-) BLACK lead into pin 2.
8. Plug the positive (+) RED lead into pin 3.

9. Loosen the mounting screw securing the drive lockout clamp.
10. While holding the reset switch, adjust the drive lockout sensor position slowly until the 5 volt reading on the multimeter drops to 0.
11. Tighten the mounting screw to secure the drive lockout sensor in position.
12. Connect the tilt actuator connector (2-pin Anderson) to the SAC.

⚠ WARNING

NEVER operate the wheelchair while in any tilted/back angle position over 20° RELATIVE TO THE HORIZONTAL SEAT POSITION. Drive lockout MUST not be adjusted beyond 20°.

The wheelchair user MUST have a clear line of sight to drive safely. On initial chair delivery and after adjusting the back angle, drive lock-out switch or tilt system, tilt the seat back to the farthest driving position immediately before drive lock-out engages and ensure there is a clear line of sight present in which to drive the wheelchair. If a clear line of sight is not present, have the back angle repositioned or readjust the lockout angle such that safe driving with a clear line of sight is achieved. Otherwise injury or damage may occur.

13. Test the up/down tilt functions.
14. Verify that drive lockout activates at or beyond 20° of tilt.

NOTE: When drive lockout activates, the wheelchair should not drive and you should get an error code (E28 or a series of flashing bars) on the joystick.

15. If drive lockout does not activate, repeat STEPS 1-14.

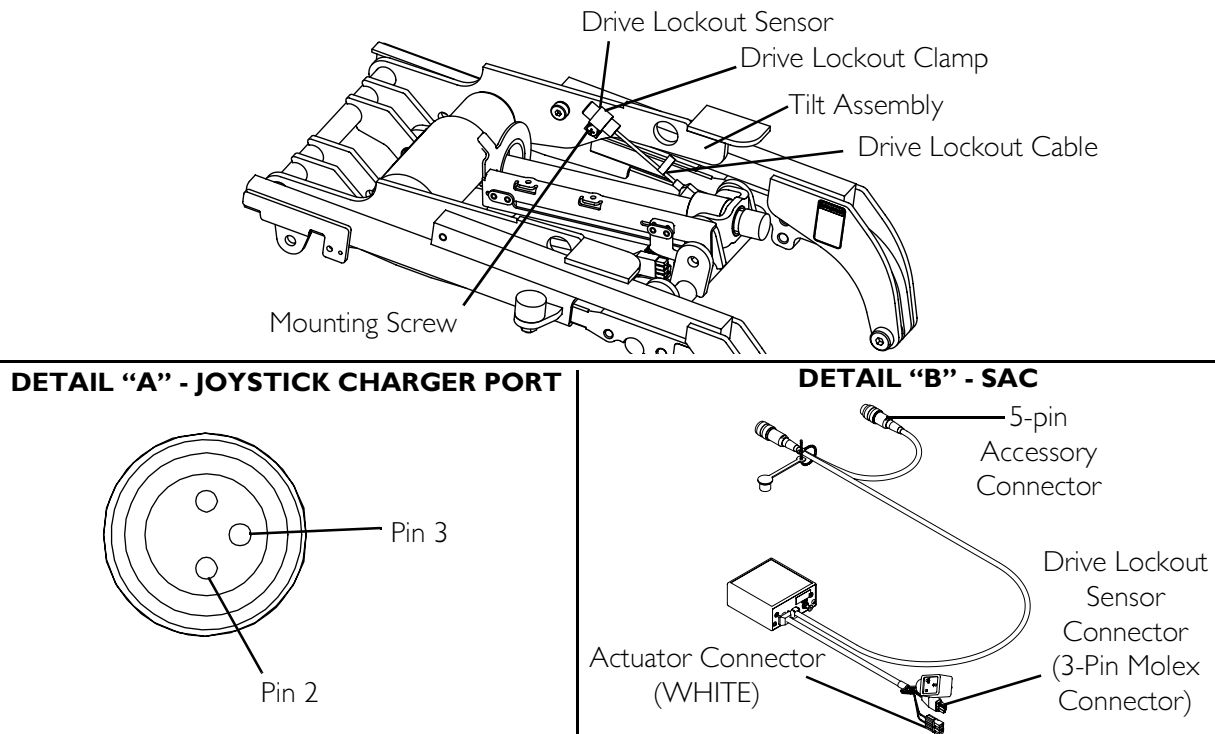


FIGURE 12.6 Adjusting the Drive Lockout Sensor for SAC

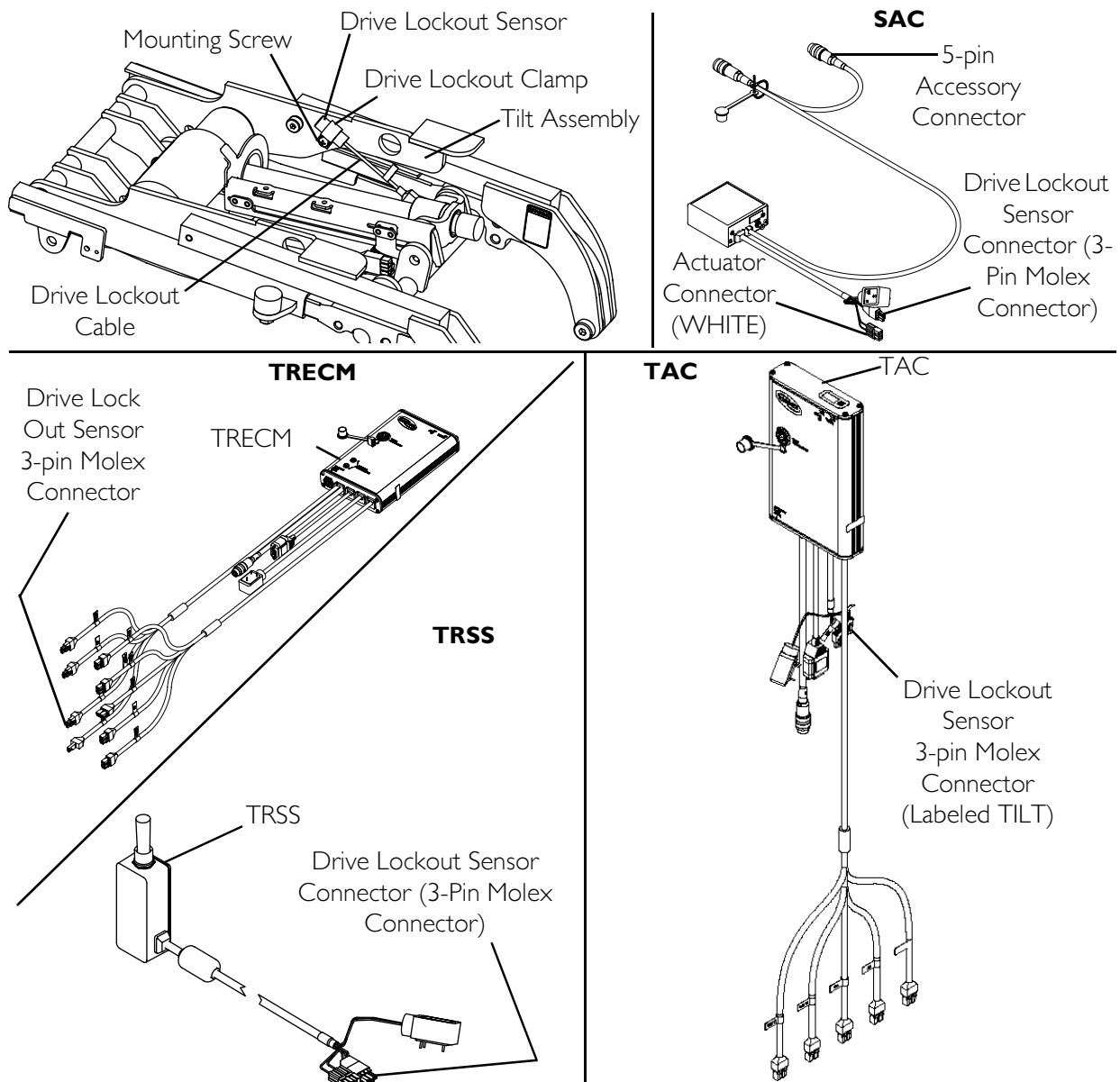
Replacing the Drive Lockout Sensor

NOTE: For this procedure, refer to FIGURE 12.7 on page 141.

1. Loosen, but DO NOT remove, the mounting screw securing the drive lockout clamp to the tilt assembly.
2. Remove the drive lockout sensor from the drive lockout clamp.
3. Unplug the drive lockout sensor from the TRECM, TAC, SAC or TRSS.
4. For proper installation, note the location of any tie-wraps securing the drive lockout sensor cable to the wheelchair.
5. Remove any tie-wraps securing the drive lockout sensor cable to the wheelchair.
6. Position the new drive lockout sensor in the drive lockout clamp.
7. Tighten the mounting screw loosened in STEP 1.
8. Plug the drive lockout sensor into the TRECM, TAC, SAC or TRSS drive lockout 3-pin Molex connector.
9. Secure the drive lockout sensor cable to the wheelchair with tie-wraps, making sure there is no excess cable which loops away from the wheelchair. Refer to Securing the Cables on page 145 for more information about properly securing the cables.

NOTE: Ensure the cables are secured in the locations noted in STEP 4.

10. Adjust the drive lockout sensor. Refer to one of the following procedures:
 - For TRECM, TAC or TRSS - Refer to Adjusting the Drive Lockout Sensor for TRSS, TRECM or TAC in Adjusting/Replacing the Drive Lockout Sensor on page 136.
 - For SAC - Refer to Adjusting the Drive Lockout Sensor for SAC in Adjusting/Replacing the Drive Lockout Sensor on page 138.

**FIGURE 12.7** Replacing the Drive Lockout Sensor

Adjusting/Replacing the Tilt Sensor

TRSS or SAC

The cam switch harness contains the tilt sensor. There is no adjustment to this switch. Refer to Removing/Installing the Cam Harness Cable on page 115 for replacement instructions.

TRECM or TAC

NOTE: For this procedure, refer to FIGURE 12.8 on page 143.

Adjusting

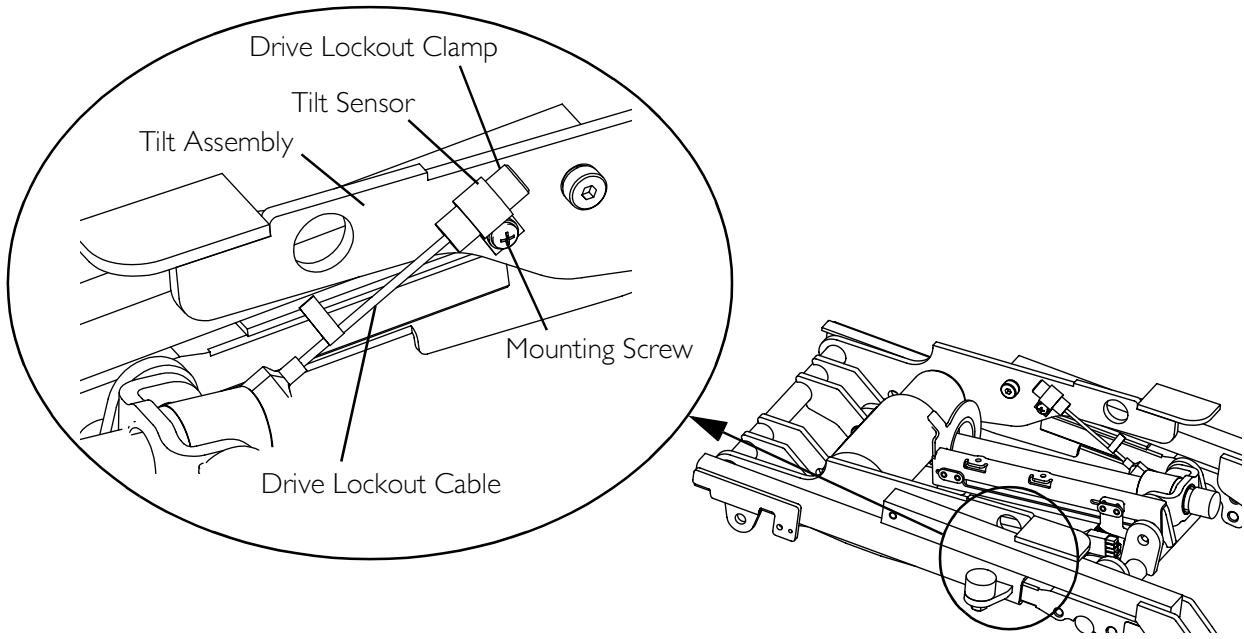
1. Tilt the seating system to the desired tilt limit angle.

NOTE: This procedure is for adjusting the tilt down limit.

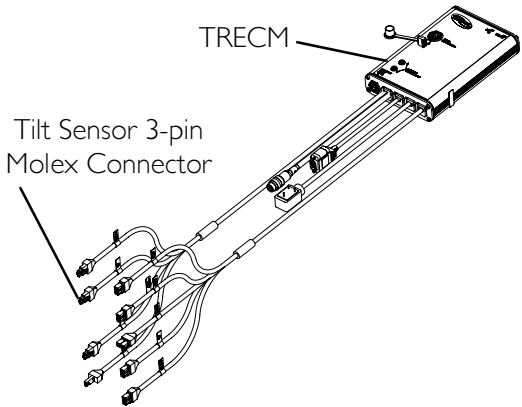
2. Plug the remote programmer into the TRECM or TAC controller.
3. Select ADVANCED MENU.
4. Select CURRENT STATUS MENU.
5. Scroll down to TILT DOWN LIMIT.
6. Loosen the mounting screw securing the tilt sensor clamp to the tilt assembly.
7. Slowly move the tilt sensor clamp in the following manner until the programmer changes from FALSE to TRUE:
 - Towards the front of the wheelchair - Increases the tilt limit angle.
 - Towards the rear of the wheelchair - Decreases the tilt limit angle.
8. Tighten the mounting screw to secure the tilt sensor clamp in the desired position.

Replacing

1. Loosen, but DO NOT remove, the mounting screw securing the tilt sensor clamp to the tilt assembly.
2. Remove the tilt sensor from the tilt sensor clamp.
3. Unplug the tilt sensor from the TRECM or TAC.
4. Remove any tie-wraps securing the tilt sensor cable to the wheelchair.
5. Position the new tilt sensor in the tilt sensor clamp.
6. Tighten the locknut loosened in STEP 1.
7. Plug the tilt sensor into the TRECM tilt sensor 3-pin Molex connector.
8. Secure the tilt sensor cable to the wheelchair with tie-wraps, making sure there is no excess cable which loops away from the wheelchair. Refer to Securing the Cables on page 145 for more information about properly securing the cables.
9. Adjust the tilt sensor. Refer to TRECM or TAC in Adjusting/Replacing the Tilt Sensor on page 142.



DETAIL "A" - TRECM



DETAIL "B" - TAC

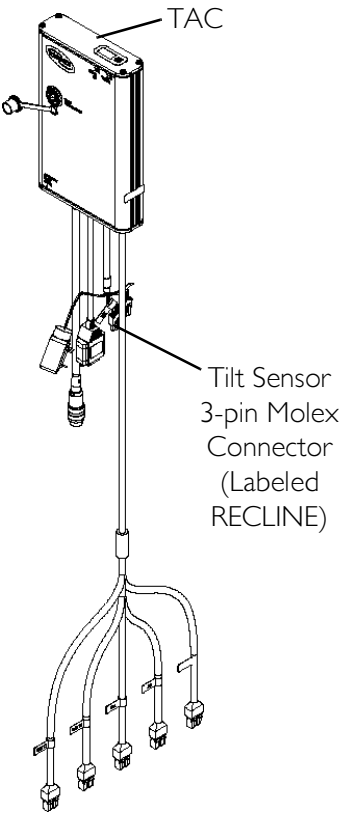


FIGURE 12.8 Adjusting/Replacing the Tilt Sensor - TRECM or TAC

Programming the TAC

NOTE: For this procedure, refer to FIGURE 12.8 on page 143.

NOTE: This procedure is for programming a TAC when it has been installed onto a system that previously had a SAC or TRSS installed.

1. Connect the remote programmer into the front face of the TAC.
2. Press the Power button to turn on the remote programmer.
3. Scroll to the ADVANCED menu and press the Select button.
4. Scroll to SYSTEM TYPE and select the appropriate standard program.
5. Press the Save button.
6. Press the Menu button.
7. Scroll to ACTUATOR SELECTION and press the Select button.
8. Select each direction input control and adjust to the following settings:
 - Forward - U/D
 - Reverse - U/D
 - Right - Up
 - Left - Down
9. Press the Save button.
10. Press the Menu button.
11. Scroll to PERFORMANCE ADJUST and press the Select button.
12. Scroll to LIMITS TYPE and press the Select button.
13. Select the appropriate input type (Mercury Switches) and press the Save button.
14. Adjust the Tilt Sensor. Refer to Adjusting/Replacing the Tilt Sensor on page 141.

SECTION 13—WIRING AND CABLES

WARNING

After any adjustments, repair or service and before use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

Before performing any maintenance, adjustments or service, always turn the wheelchair power off, otherwise injury or damage may result.

Securing the Cables

WARNING

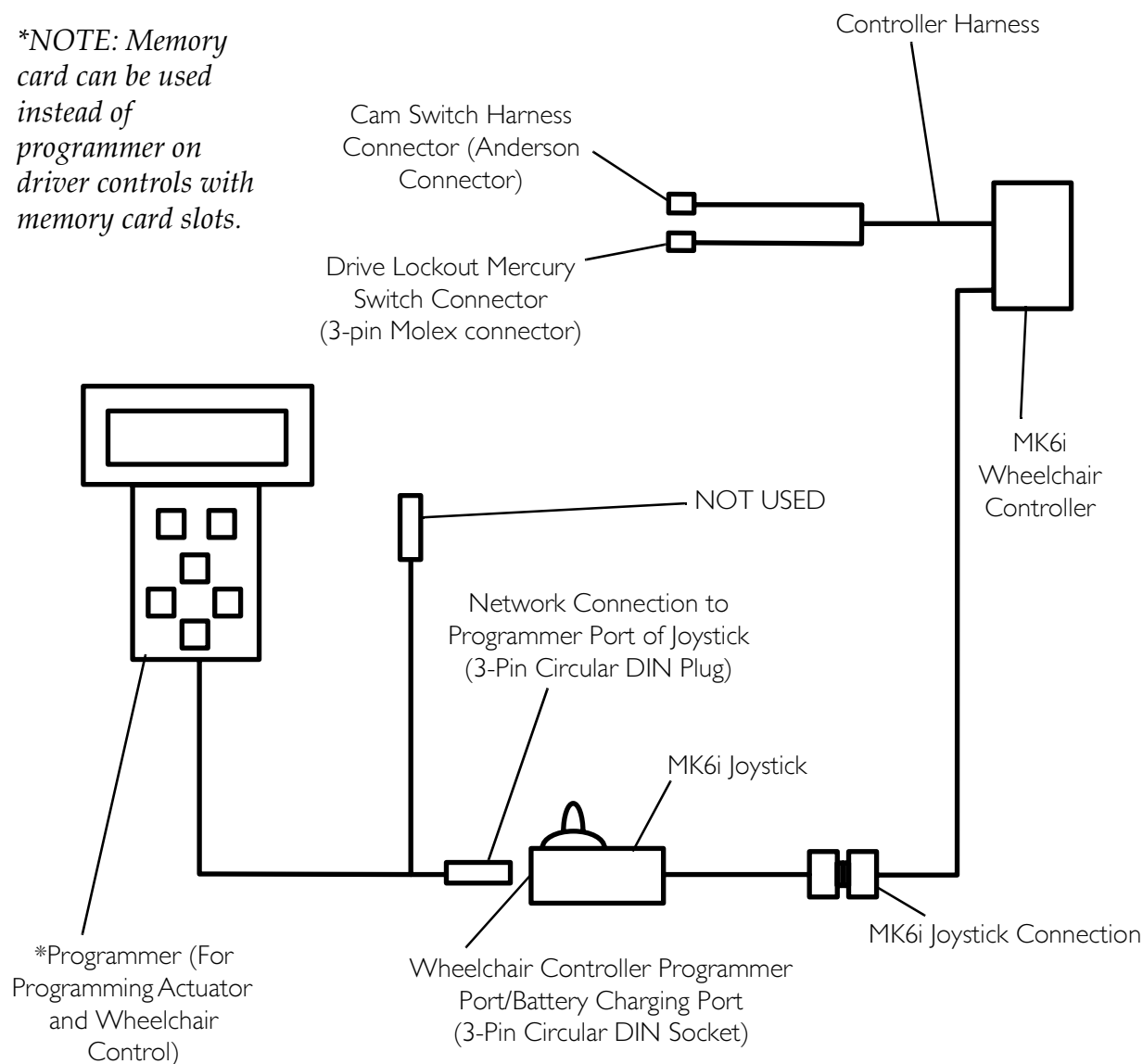
Cables **MUST** be secured to the wheelchair frame and/or base with tie-wraps after servicing is complete. Failure to follow the warnings and instructions listed below will result in injury to the users, attendants and/or bystanders and/or damage to the wheelchair.

Cables **MUST** be secured so there are no loops of excess cable extending away from the wheelchair. Bundle all excess cable together and secure with a tie-wrap. It may also be necessary to secure these bundles to the frame and/or base.

Always test all wheelchair functions after securing the cables to ensure cables **DO NOT** get pinched or crushed during operation of the wheelchair.

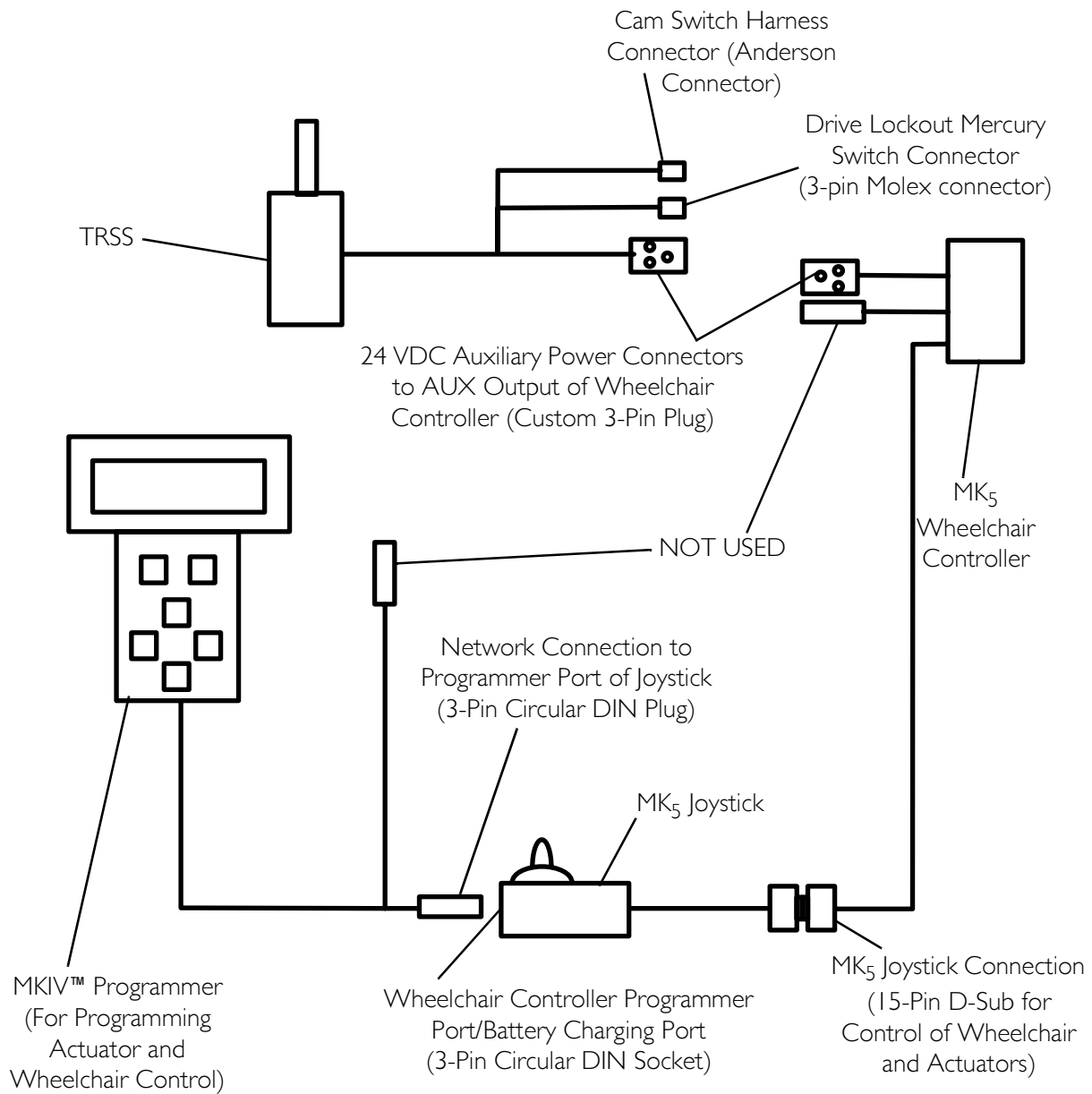
MK6i Wiring Schematics

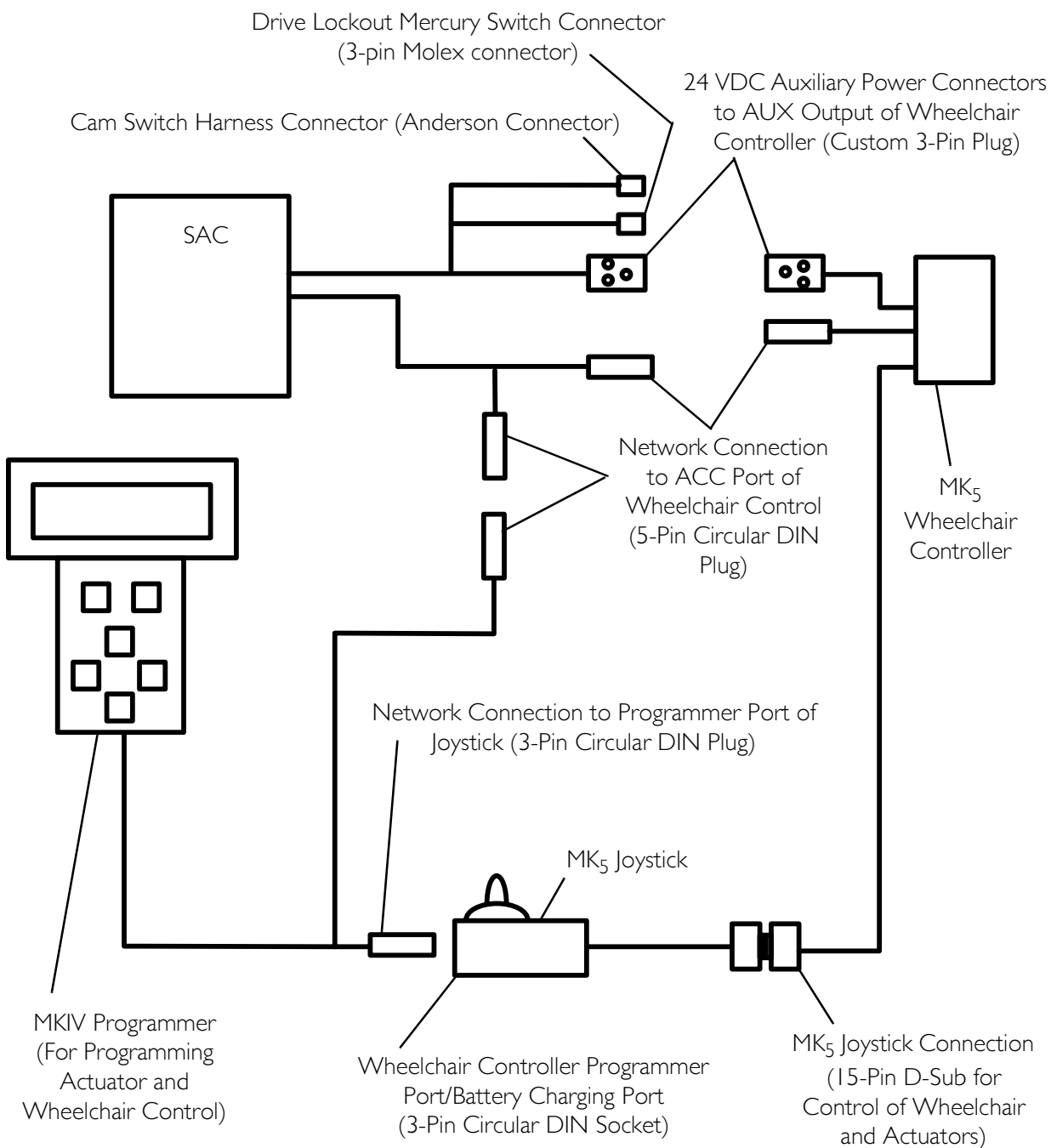
**NOTE: Memory card can be used instead of programmer on driver controls with memory card slots.*

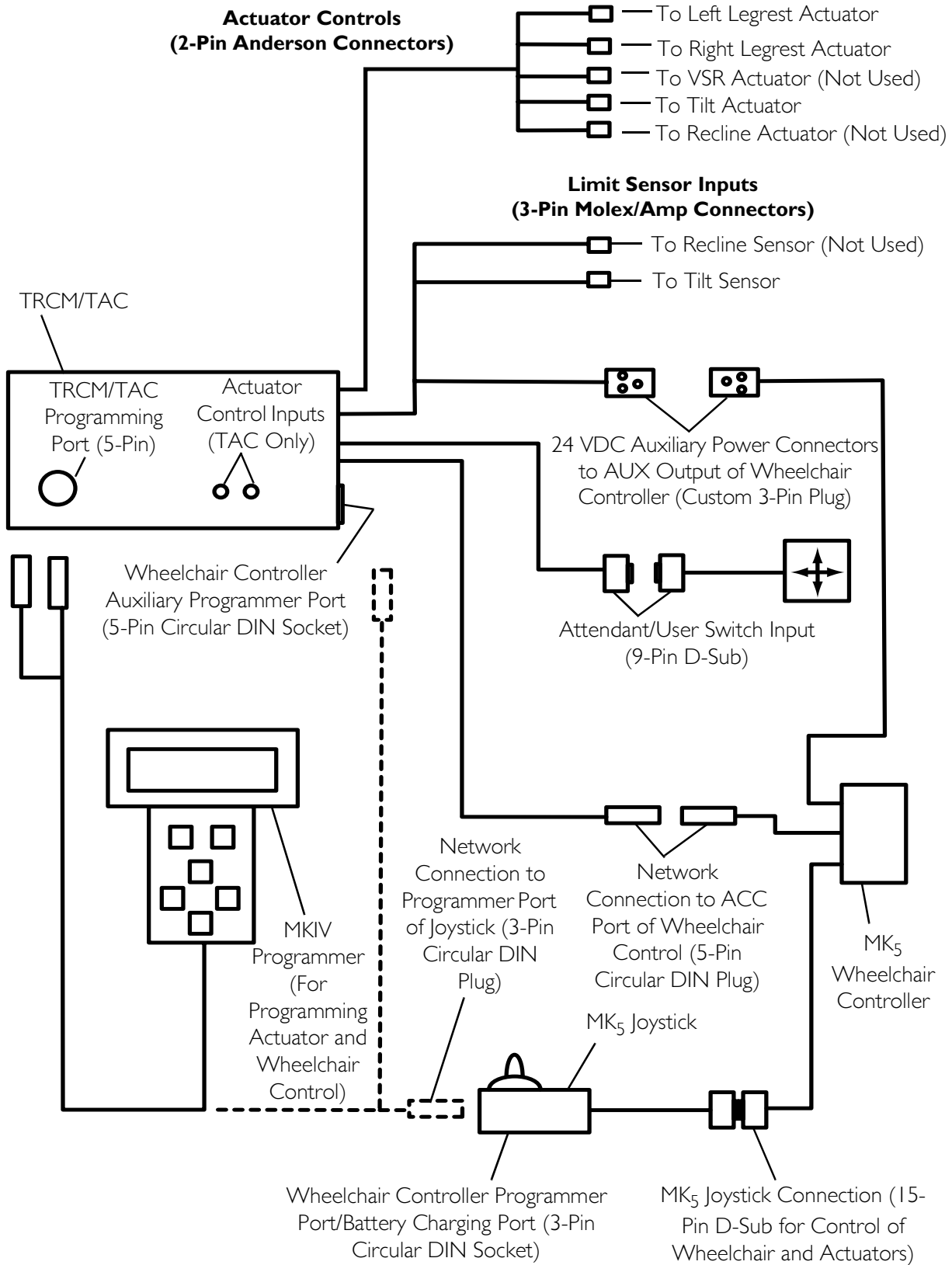


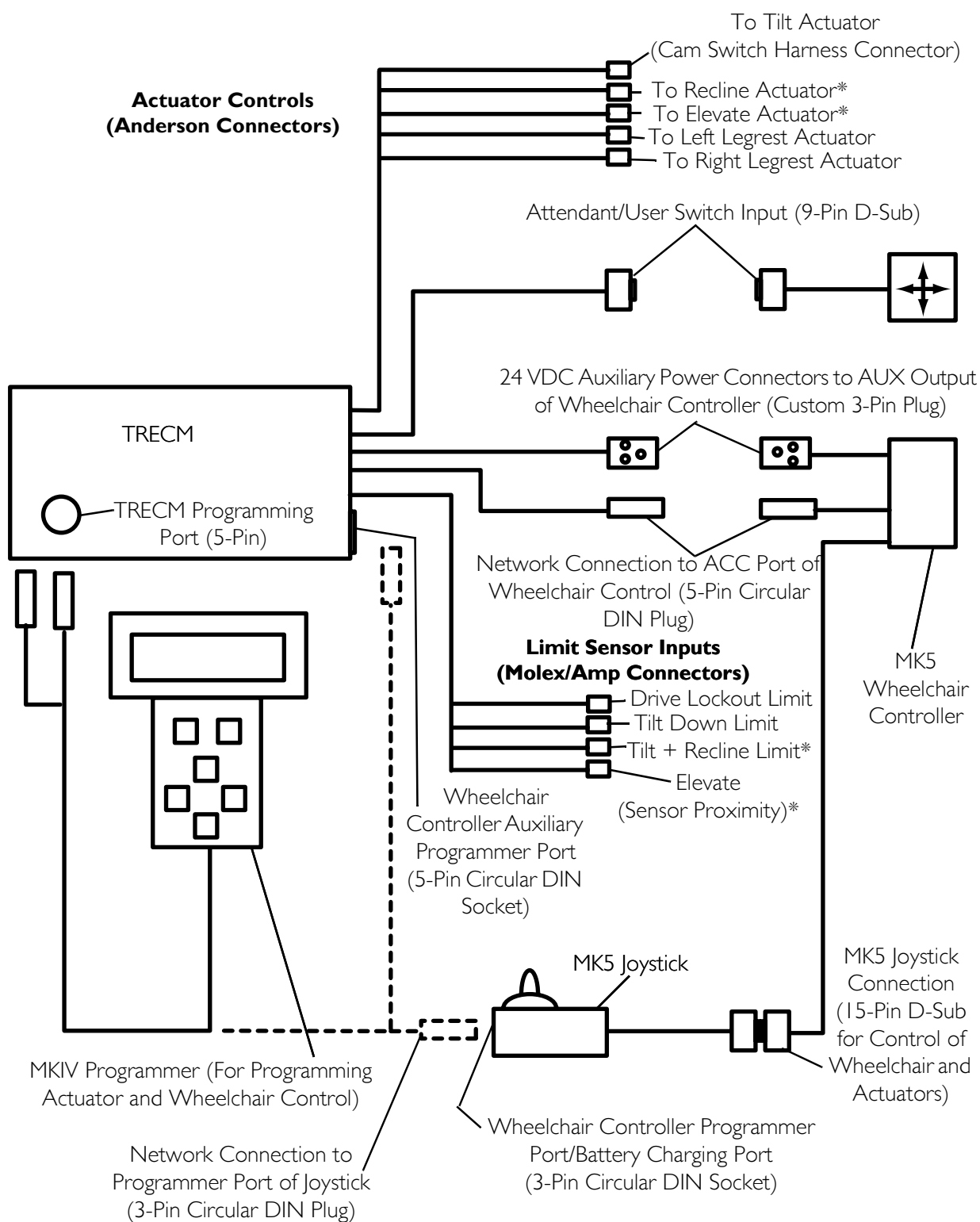
MK₅ Wiring Schematics

TRSS



SAC

TAC

TRECM (TDX Wheelchairs Only)

*NOTE: These are not used.

SECTION 14—M9I BATTERIES

⚠ WARNING

Make sure power to the wheelchair is **OFF** before performing this section.

NEVER allow any of your tools and/or battery cable(s) to contact **BOTH** battery terminal(s)/post(s) at the same time. An electrical short may occur and serious personal injury or damage may occur.

The use of rubber gloves is recommended when working with batteries.

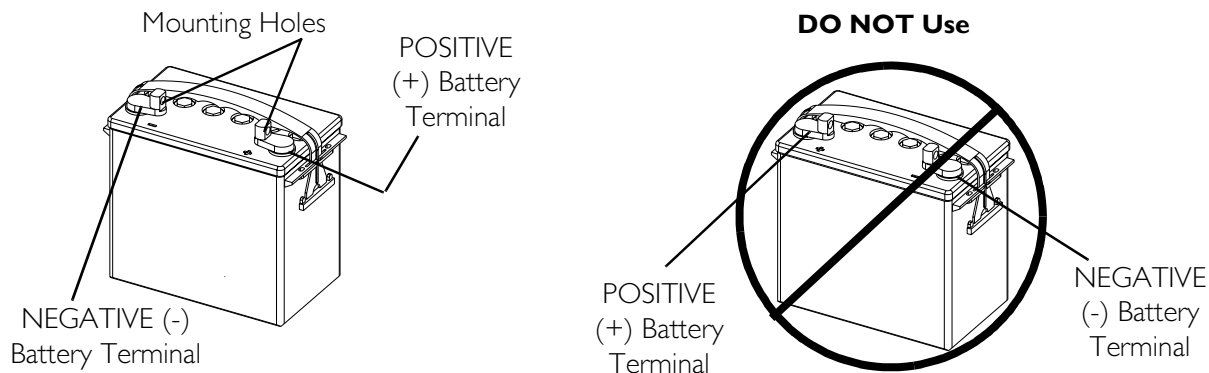
Always use a battery lifting strap when lifting a battery. It is the most convenient method and assures that the battery acid will not spill. It also helps to prolong the life of the battery.

DO NOT tip the batteries. Keep the batteries in an upright position.

Invacare strongly recommends that battery installation and battery replacement always be done by a qualified technician.

After **ANY** adjustments, repair or service and **BEFORE** use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

Battery terminal configuration shown below **MUST** be used. Batteries that have the reversed terminal configuration **MUST NOT** be used - otherwise serious injury or damage may occur.



CAUTION

When connecting the battery cables to the batteries, the battery cable(s) **MUST** be connected to the battery terminal(s)/post(s) as shown in **FIGURE 14.3** otherwise damage to the battery may result.

For proper battery connection, batteries **MUST** use post style terminals with mounting holes through the terminal.

NOTE: If there is battery acid in the bottom of the battery tray or on the sides of the batteries, apply baking soda to these areas to neutralize the battery acid. Before reinstalling the existing or new batteries, clean the baking soda from the battery tray or batteries being sure to avoid contact with skin and eyes. Determine source of contamination. Never install/reinstall a battery with a cracked or otherwise damaged case.

Installing/Removing the Batteries

NOTE: For this procedure, refer to FIGURE 14.1 on page 153 and FIGURE 14.2 on page 153.

NOTE: Have the following tools available:

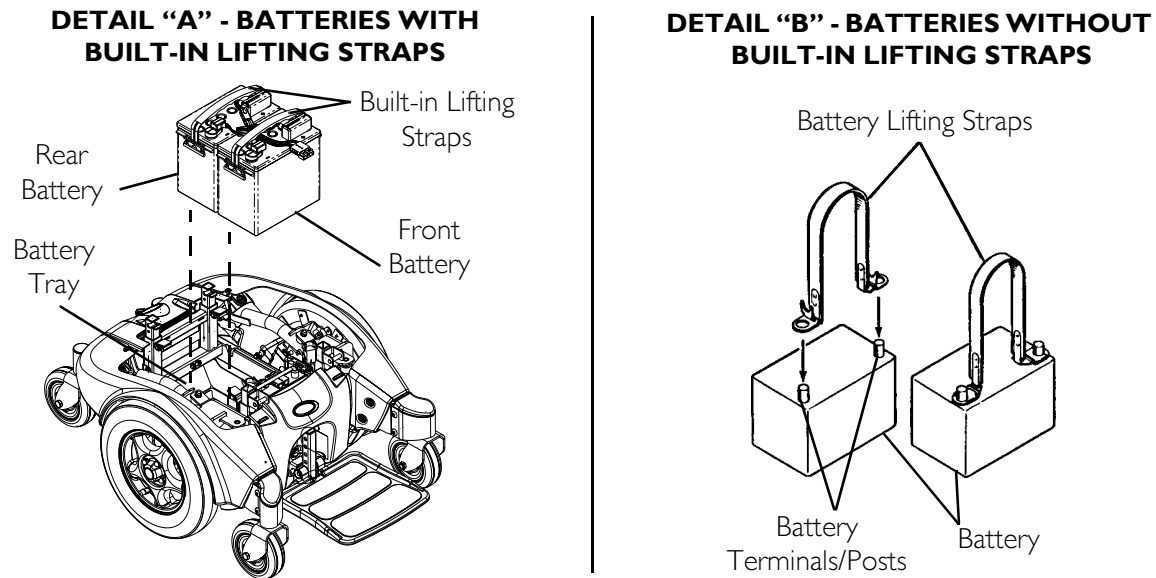
TOOL	QTY	COMMENTS
Battery Lifting Strap	1	Supplied
1/2-inch (6 pt) Box Wrench	1	Not Supplied
7/16-inch (6pt) Box Wrench	1	Not Supplied
3/8-inch (6pt) Box Wrench	1	Not Supplied
Diagonal Cutters	1	Not Supplied

Installing

1. Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.
2. Verify the joystick On/Off switch is in the OFF position and disconnect joystick.
3. Tilt the seat back. Refer to Tilting the Seat Assembly on page 82.
4. Remove the top shroud.
5. If necessary, disconnect right and left motor leads to allow access to the front of the battery tray.
6. Move aside the motor leads and controller cable to allow unobstructed access to the front of the battery tray.

NOTE: Perform this section on one battery at a time starting with the rear battery. Repeat STEP 6 to position the remaining battery into the battery tray.

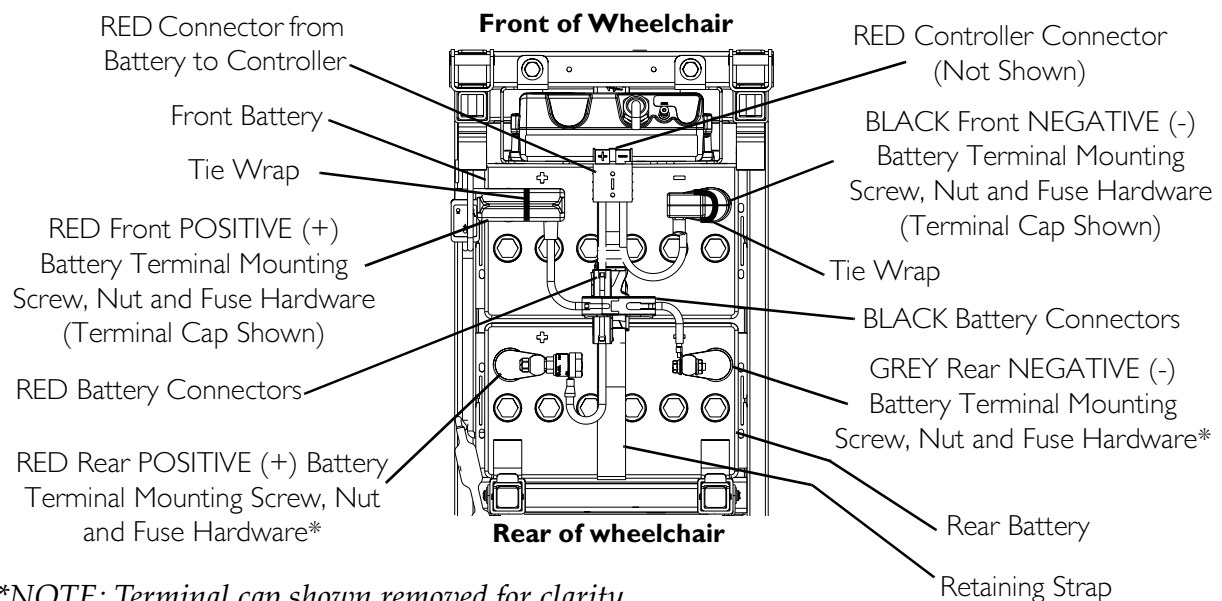
7. Perform one of the following to position the battery into the battery tray:
 - A. Batteries With Built In Lifting Strap - Use built in lifting strap to position battery into the battery tray (Detail "A" of FIGURE 14.1).
 - B. Batteries Without Built In Lifting Strap - Use the battery lifting strap to position battery into the battery tray. When battery is in proper position, remove lifting strap (Detail "B" of FIGURE 14.1).
8. Using the battery retaining strap, secure the two batteries into the battery tray.
9. If necessary, connect the wiring harness to the two batteries. Refer to Connecting/Disconnecting the Battery Wiring Harness on page 155.
10. Reconnect RIGHT and LEFT motor leads to allow access to the FRONT of the battery tray, if disconnected in STEP 5.

**FIGURE 14.1** Batteries with/without Lifting straps

11. Connect the front battery to the controller (RED connector). Refer to FIGURE 14.2.
12. Connect the rear battery to the front battery (RED and BLACK connectors). Refer to FIGURE 14.2.
13. Reinstall the top shroud.
14. Tilt the seat forward. Refer to Tilting the Seat Assembly on page 82.
15. Connect the joystick.

NOTE: New batteries MUST be fully charged BEFORE using, otherwise the life of the batteries will be reduced.

16. If necessary, charge the batteries. Refer to Charging Batteries on page 157.



**NOTE: Terminal cap shown removed for clarity.*

FIGURE 14.2 Installing/Removing the Batteries

Removing

1. Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.
2. Verify the joystick On/Off switch is in the Off position and disconnect joystick.
3. Tilt the seat back. Refer to Tilting the Seat Assembly on page 82.
4. Remove the top shroud.
5. If necessary, disconnect right and left motor leads to allow access to the front of the battery tray.
6. Disconnect the front battery from controller (RED connector). Refer to FIGURE 14.2.
7. Move aside the motor leads and controller cable to allow unobstructed access to the front of the battery tray.
8. Disconnect the rear battery from the front battery (RED and BLACK connectors). Refer to FIGURE 14.2.
9. If necessary, disconnect the wiring harness from batteries. Refer to Connecting/Disconnecting the Battery Wiring Harness on page 155.
10. Unfasten the retaining strap that secures the two batteries in the battery tray.

NOTE: Perform this section on one battery at a time starting with the FRONT battery. Repeat STEP 10 to remove remaining battery from battery tray.

11. Perform one of the following to remove the battery from the battery tray:
 - A. Batteries With Built-in Lifting Strap- Use built in lifting strap to remove the battery from the battery tray (Detail "A" of FIGURE 14.1).
 - B. Batteries Without Built-in Lifting Strap- Use the battery lifting strap to remove the battery from the battery tray (Detail "B" of FIGURE 14.1).

Connecting/Disconnecting the Battery Wiring Harness

NOTE: Perform this section on one battery at a time starting with the front battery.

NOTE: The front battery has three connectors - two to the rear battery wiring harness (RED and BLACK) and one to the controller cable (RED), and the rear battery has two connectors (RED and BLACK) to the front battery wiring harness.

NOTE: Both the front and rear wiring harnesses are shipped with the POSITIVE (+) RED battery cable and mounting screw connected. Use the exposed, threaded portion of the mounting screw to secure the POSITIVE (+) RED cable to the POSITIVE (+) terminal.

⚠ WARNING

DO NOT remove fuse or mounting hardware from **POSITIVE (+) RED** battery cable/mounting screw.

All battery terminal covers (two on the front battery and two on the rear battery) MUST be installed prior to use.

Connecting

NOTE: For this procedure, refer to FIGURE 14.3 on page 156.

1. Peel back RED battery terminal cover to expose RED battery cable connection to battery terminal.
2. Peel back BLACK battery terminal cover from BLACK battery cable on front battery or GREY battery terminal cover from BLACK battery cable on rear battery.
3. Using the mounting screws and nuts, secure the NEGATIVE (-) BLACK battery cable to NEGATIVE (-) battery terminal/post as shown in FIGURE 14.3.
4. Using the mounting screws and nuts, secure the POSITIVE (+) RED battery cable to POSITIVE (+) battery terminal/post as shown in FIGURE 14.3.
5. Verify wiring harness is correctly installed and securely tightened.
6. Verify proper battery orientation.
7. Reposition battery terminal covers over battery post(s).
8. Using new tie-wraps, secure the terminal covers to the battery terminals as shown in FIGURE 14.3.
9. Repeat STEPS 1-8 to install and connect the rear battery to the rear battery harness.

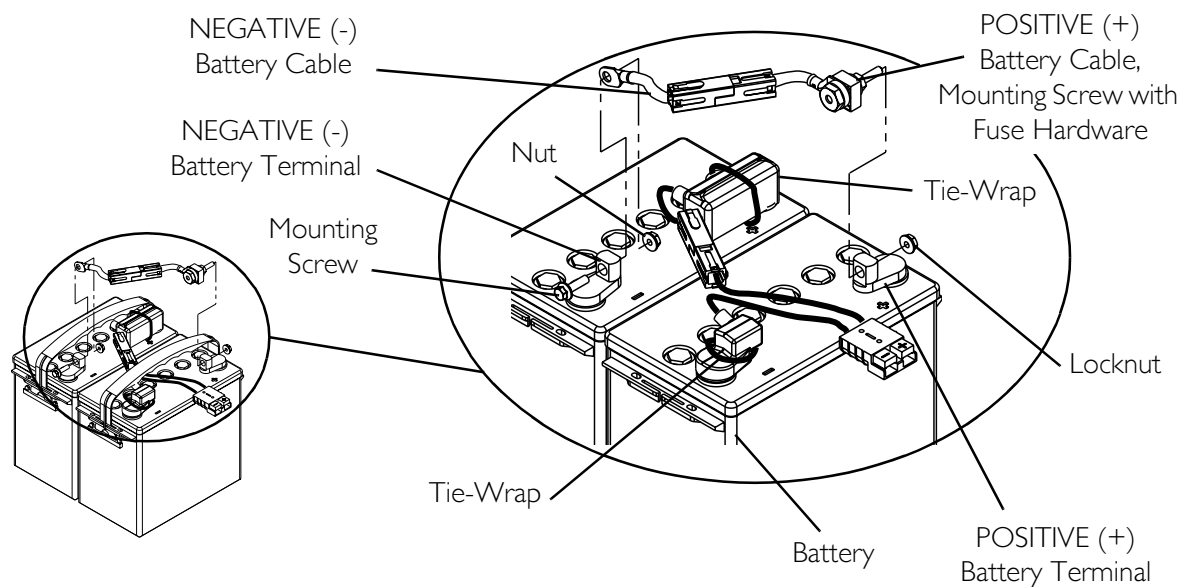


FIGURE 14.3 Connecting/Disconnecting the Battery Wiring Harness

Disconnecting

NOTE: For this procedure, refer to FIGURE 14.3.

1. Remove the existing tie-wraps that secure the battery terminal covers to the battery terminals.
2. Peel back RED battery terminal cover to expose RED battery cable connection to battery terminal.
3. Peel back BLACK battery terminal cover from BLACK battery cable on front battery or GREY battery terminal cover from BLACK battery cable on rear battery.
4. Remove the mounting screws and nuts that secure the POSITIVE (+) RED battery cable to the POSITIVE (+) battery terminal/post as shown in FIGURE 14.3.
5. Remove the mounting screws and nuts that secure the NEGATIVE (-) BLACK battery cable to the NEGATIVE (-) battery terminal/post as shown in FIGURE 14.3.
6. Set wiring harness aside.
7. Repeat STEPS 1-6 to disconnect the rear battery from the rear battery harness.

Charging Batteries

⚠ DANGER

When using an extension cord, use only a three wire extension cord having at least 16 AWG (American Wire Gauge) wire and the same or higher electrical rating as the device being connected. Use of improper extension cord could result in a risk of fire and electric shock. Three prong to two prong adapters should not be used. Use of three prong adapters can result in improper grounding and present a shock hazard to the user.

⚠ WARNING

Never attempt to recharge the batteries by attaching cables directly to the battery terminals.

DO NOT attempt to recharge the batteries and operate the wheelchair at the same time.

DO NOT attempt to recharge the batteries when the wheelchair has been exposed to **ANY** type of moisture.

DO NOT attempt to recharge the batteries when the wheelchair is outside.

DO NOT sit in the wheelchair while charging the batteries.

DO NOT attempt to recharge the batteries using both the on-board battery charger and an independent battery charger (plugged into the joystick charger port) at the same time. Doing so will reduce the life of the batteries.

READ and **CAREFULLY** follow the manufactures instructions for each charger (supplied or purchased). If charging instructions are not supplied, consult a qualified technician for proper procedures prior to use.

CAUTION

New batteries **MUST** be fully charged prior to initial use of the wheelchair.

Always fully charge new batteries before initial use or battery life will be reduced.

As a general rule, you should recharge your batteries as frequently as possible to assure the longest possible life and to minimize required charging time. Plan to recharge them when you do not anticipate using the wheelchair.

Some basic concepts which will help you understand this automatic process are:

The amount of electrical current drawn within a given time to charge a battery is called “charge rate”. If, due to usage, the charge stored in the battery is low, the charge rate is high. As a charge builds up, the charge rate is reduced, and the battery charger rate decreases to a “trickle charge”.

NOTE: If the batteries need to be charged more often or take longer to charge than normal, they may need to be replaced. Contact a qualified technician.

NOTE: The batteries can be charged using the on-board battery charger or by plugging an independent battery charger into the port located on the front of the SPJ-80/DPJ/MPJ joysticks.

Battery Charger Operation

⚠ DANGER

When using an extension cord, use only a three wire extension cord having at least 16 AWG (American Wire Gauge) wire and the same or higher electrical rating as the device being connected. Use of improper extension cord could result in a risk of fire and electric shock. Three prong to two prong adapters should not be used. Use of three prong adapters can result in improper grounding and present a shock hazard to the user.

⚠ WARNING

READ and CAREFULLY follow the manufacturer's instructions for each charger (supplied or purchased). If charging instructions are not supplied, consult a qualified technician for proper procedures prior to use.

If the circuit breaker trips repeatedly, **IMMEDIATELY** unplug charger and contact dealer or a qualified technician.

On-Board Battery Charger

⚠ WARNING

Ensure the pins of the extension cord plug are the same number, size, and shape as those on the charger.

DO NOT under any circumstances cut or remove the round grounding plug from the charger AC cable plug or the extension cord plug.

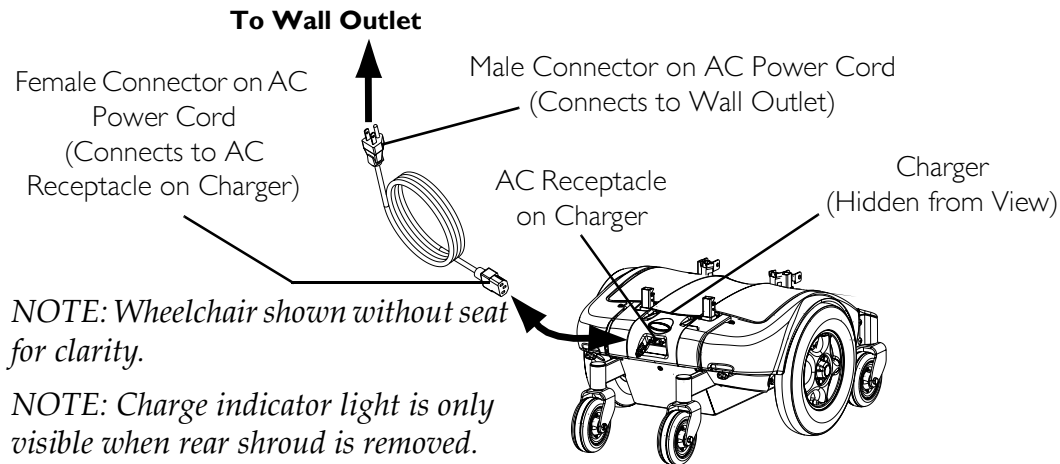
NOTE: For this procedure, refer to FIGURE 14.4 on page 159.

NOTE: Charge indicator light is only visible with rear shroud removed.

1. Plug the female connector of the AC power cord (supplied) to the AC receptacle on the charger and plug in the male connector on the AC power cord into the wall outlet.
2. The On/Off LED indicator illuminates solid RED indicating that the charger is On.
3. If the On/Off LED indicator is "Blinking" RED, this is abnormal. Unplug AC power cord from the on-board battery charger and wall outlet. Contact Invacare at the number listed on the back page of this manual.
4. When the On/Off LED indicator light is Off, charger is Off.
5. When the Charge LED indicator light is YELLOW, the batteries are charging.
6. When the Charge LED indicator light is solid GREEN, the batteries are fully charged (as their condition will allow). At this point, the charger automatically stops charging.
7. When charging is complete, unplug the male connector of the AC power cord from the wall outlet and then unplug the female connector of the AC power cord from the AC receptacle on the charger.

⚠ WARNING

DO NOT operate wheelchair with AC power cord attached to the wheelchair.



CHARGING INDICATOR	STATUS
YELLOW	Charging (Under 80%)
“Blinking” YELLOW	Partially Charges (Over 80%)
Solid GREEN	Fully Charges
LED “Off”	Charger Disconnected
Solid RED or “Blinking” RED	Under Voltage
	Over Voltage
	Over Temperature

FIGURE 14.4 On-Board Battery Charger

Independent Charger

⚠ WARNING

READ and CAREFULLY follow the individual instructions for each charger (supplied or purchased). If charging instructions are not supplied, consult a qualified technician for proper procedures.

CAUTION

DO NOT use an independent charger with an output rating of over 8A (amps). Otherwise, damage may occur.

NOTE: For this procedure, refer to FIGURE 14.5 on page 160.

NOTE: The charger port located on the Front of the joystick requires the use of an independent charger. The independent charger is NOT supplied with the wheelchair.

Required Items: Battery Charger*, Power Cord**

*NOTE: Item not supplied.

**NOTE: AC power cord (3-prong plug, 15 ampere current rating; industrial type).

1. Attach the battery charger connector to the charger port on the front of the joystick.
2. Plug the charger's AC power cord or extension into the grounded 110-volt wall outlet.
3. Unplug the AC power cord or extension once charging is complete.

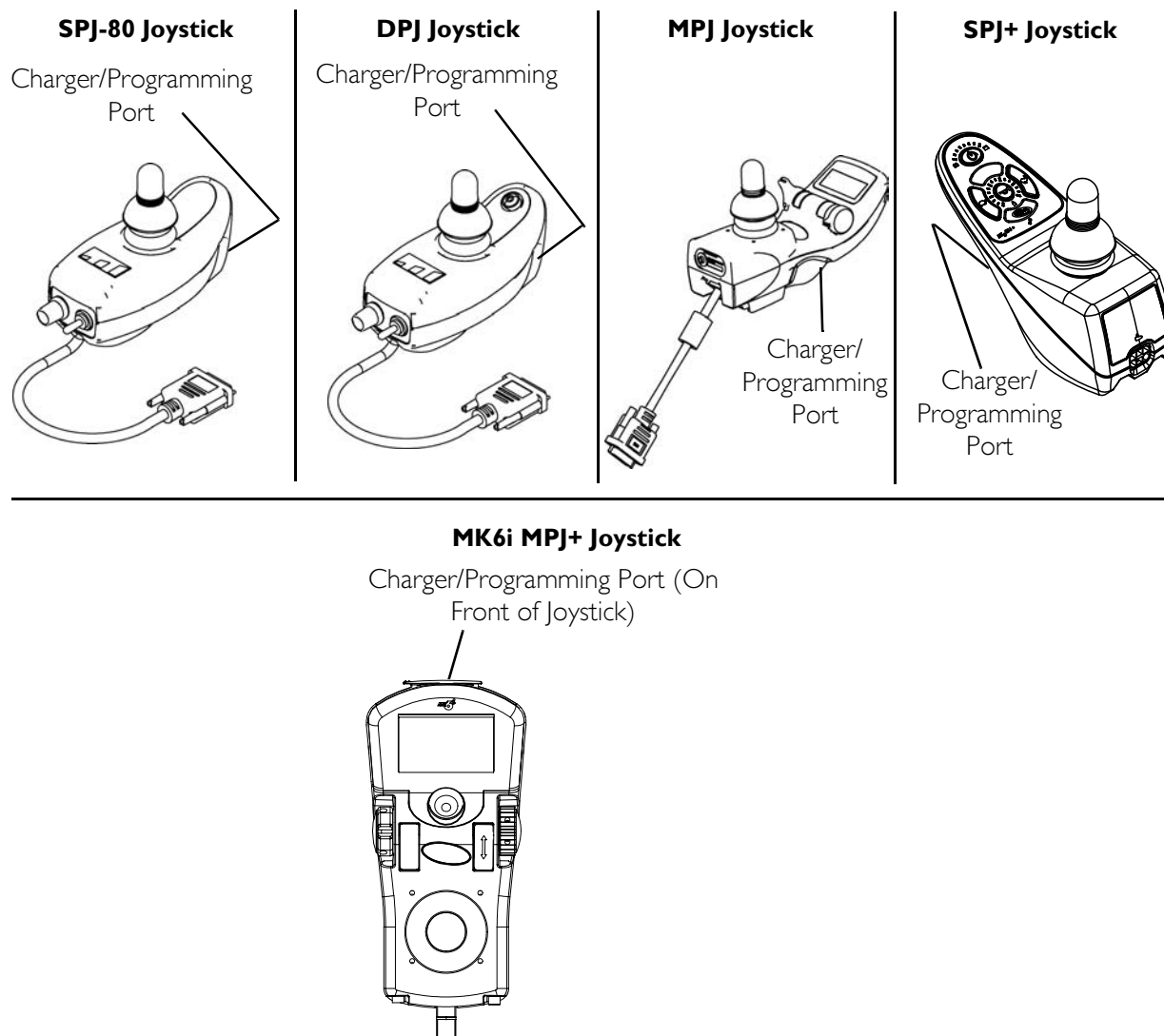


FIGURE 14.5 Independent Charger

SECTION 15—M71 BATTERIES

Warnings For Handling and Replacing Batteries

⚠ WARNING

After **ANY** adjustments, repair or service and **BEFORE** use, make sure that all attaching hardware is tightened securely - otherwise injury or damage may result.

Make sure power to the wheelchair is **OFF** before performing this section.

The use of rubber gloves is recommended when working with batteries.

Invacare strongly recommends that battery installation and battery replacement **ALWAYS** be done by a qualified technician.

UI batteries weight 18 pounds each. Use proper lifting techniques (lift with your legs) to avoid injury.

Use UI batteries only. Failure to use the correct battery size and/or voltage may cause damage to your wheelchair and give you unsatisfactory performance.

ALWAYS use a battery lifting strap when lifting a battery. It is the most convenient method and assures that the battery acid will not spill. It also helps to prolong the life of the battery.

DO NOT tip the batteries. Keep the batteries in an upright position.

NEVER allow any of your tools and/or battery cables to contact **BOTH** battery posts at the same time. An electrical short may occur and serious personal injury or damage may occur.

The **POSITIVE (+) RED** battery cable must connect to the **POSITIVE (+)** battery terminal, otherwise serious damage will occur to the electrical system.

NOTE: If there is battery acid in the bottom of the battery tray or on the sides of the batteries, apply baking soda to these areas to neutralize the battery acid. Before reinstalling the existing or new batteries, clean the baking soda from the battery tray or batteries being sure to avoid contact with skin and eyes. Determine source of contamination. Never install/reinstall a battery with a cracked or otherwise damaged case.

Using the Proper Batteries

NOTE: For this procedure, refer to FIGURE 15.1 on page 162.

1. Place battery on ground/flat surface.
2. Visually draw a horizontal and vertical centerline through the middle of battery (FIGURE 15.1).
3. Position the battery so that the terminals are above the horizontal centerline.
4. Visually inspect the battery to ensure the correct position of the **POSITIVE** and **NEGATIVE** terminals (FIGURE 15.1):

⚠ WARNING

Batteries with terminal configuration as shown below **MUST** be used. Batteries that have the reverse terminal configuration **MUST NOT** be used - otherwise injury and damage may occur.

Terminals **MUST** have a cross hole in them as shown below

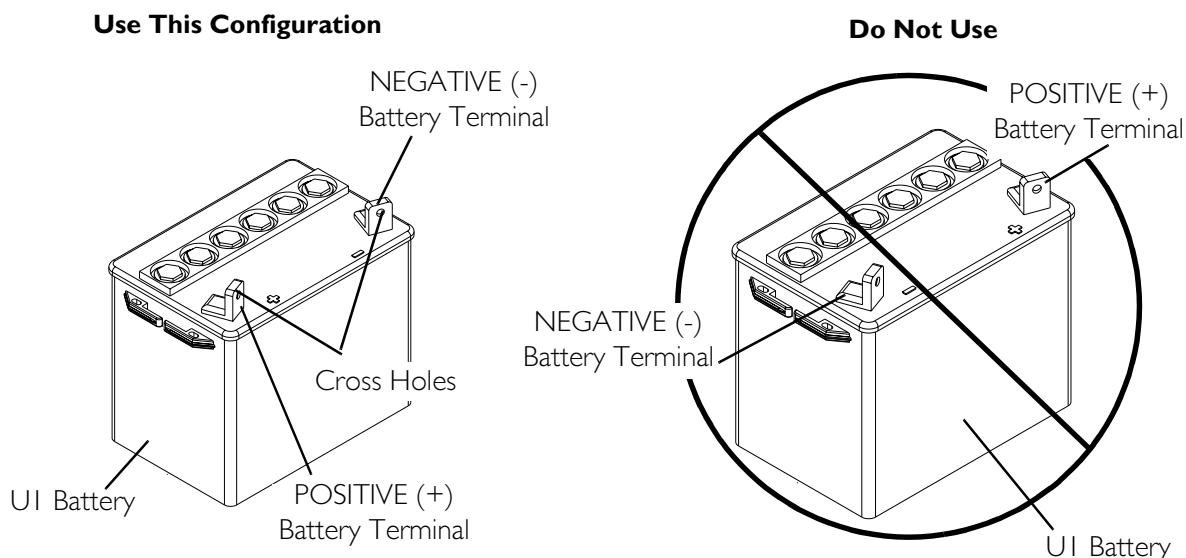


FIGURE 15.1 Using the Proper Batteries

Removing/Installing Batteries from/into Battery Tray

⚠ WARNING

Always use the battery handle or lifting strap when lifting the battery. It is the most convenient method and assures that the battery acid will not spill. It also helps to prolong the life of the battery.

DO NOT tip the batteries. Keep the batteries in an upright position.

NOTE: For this procedure, refer to FIGURE 15.2 on page 164.

NOTE: Have the following tools available:

TOOL	QTY	COMMENTS
7/16-INCH (6PT) BOX WRENCH	1	Not Supplied
DIAGONAL CUTTERS	1	Not Supplied

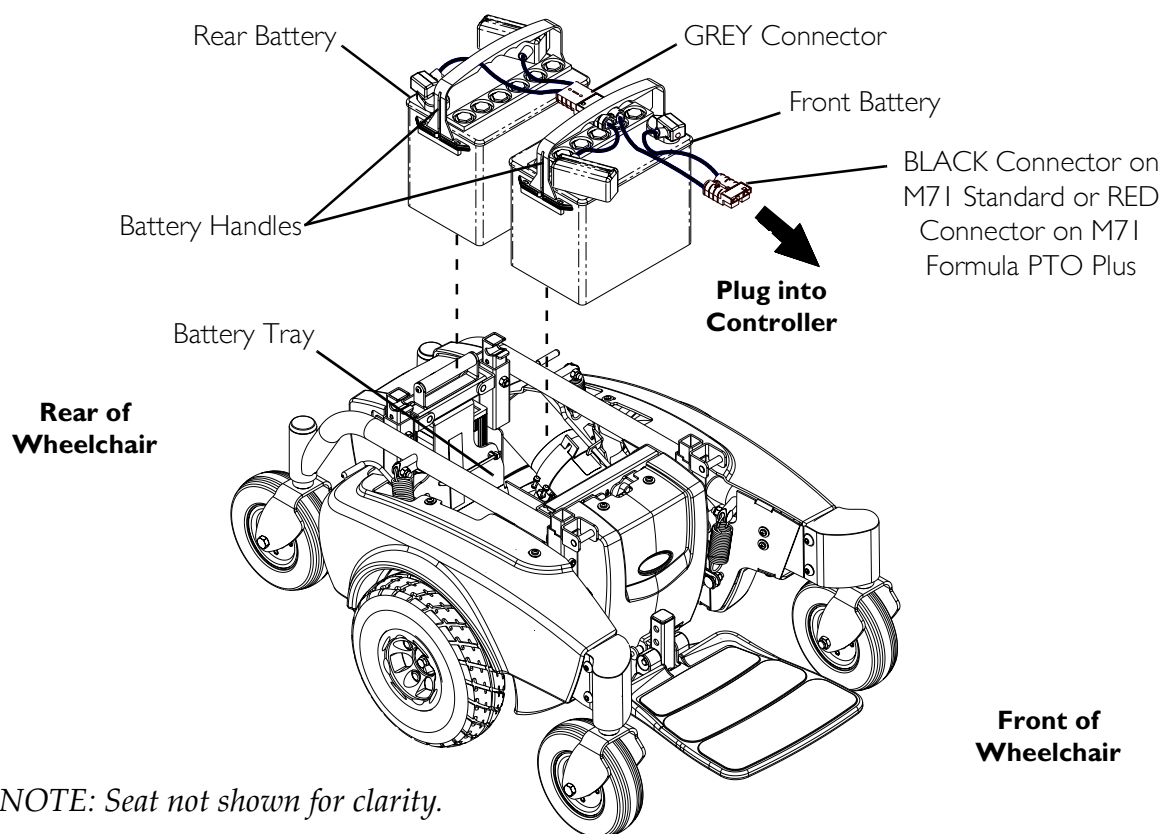
NOTE: If there is battery acid in the bottom of the battery tray or on the sides of the batteries, apply baking soda to these areas to neutralize the battery acid. Before reinstalling the existing or new batteries, clean the baking soda from the battery tray or batteries being sure to avoid contact with skin and eyes. Determine source of contamination. Never install/reinstall a battery with a cracked or otherwise damaged case.

Removing

1. Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.
2. Tilt the seat back. Refer to Tilting the Seat Assembly on page 82.
3. Verify the joystick On/Off switch is in the Off position and disconnect joystick cable (not shown).
4. Disconnect the front battery from the controller (BLACK connector on the standard M71 OR RED connector on the M71 Formula PTO Plus).
5. Disconnect the rear battery from the front battery (GREY connector).
6. Lift the rear battery out of the battery tray using the battery handle or lifting strap.
7. Slide front battery back and lift out of battery tray using the battery handle or lifting strap.

Installing

1. Verify the joystick On/Off switch is in the Off position and disconnect joystick cable (not shown).
2. Position front battery in rear of battery tray and slide forward into position (FIGURE 15.2).
3. Position rear battery in rear of battery tray (FIGURE 15.2).
4. Connect the rear battery to the front battery (GREY connector).
5. Connect the front battery to the controller (BLACK connector on the standard M71 OR RED connector on M71 Formula PTO Plus).
6. Tilt the seat forward. Refer to Tilting the Seat Assembly on page 82.
7. Connect joystick cable (not shown).



NOTE: Seat not shown for clarity.

FIGURE 15.2 Removing/Installing Batteries from/into Battery Tray

Connecting/Disconnecting Battery Cables

NOTE: For this procedure, refer to FIGURE 15.4 on page 170.

Connecting Battery Cables

⚠ WARNING

NEVER allow any of your tools and/or battery cables to contact **BOTH** battery terminals at the same time. An electrical short may occur and serious personal injury or damage may occur.

The use of rubber gloves is recommended when working with batteries.

Battery terminal configuration as shown in FIGURE 15.3, DETAIL “A”, **MUST** be used. Batteries that have the terminal configuration reversed **MUST NOT** be used - otherwise serious injury or damage may occur.

DO NOT remove fuse or mounting hardware from **POSITIVE (+) RED** battery cable/mounting screw.

All battery terminal covers (two on the front battery and two on the rear battery) **MUST** be installed prior to use.

DO NOT route wires under the battery lifting strap.

CAUTION

When connecting the battery cables to the batteries, the battery cables **MUST be connected to the battery terminals as shown in FIGURE 15.3, DETAIL “B”, (depending on battery type), otherwise damage to the battery cable may result when installing battery terminal caps.**

1. If the batteries being installed do not have built-in handles, perform the following steps:
 - A. Unfasten the hook and loop strips on the wide part of the battery lifting strap.
 - B. Place the wide part of the lifting strap around the middle of the battery with the hook and loop strips on top, as shown in FIGURE 15.3.
 - C. Pull the wide strap ends tightly around the battery and fasten them together.
 - D. Position the strap as close to the middle of the battery as possible so that it does not tip when lifted by the handle.
 - E. Repeat STEPS A-D for the remaining battery.
2. Secure the battery cables to the battery terminals as described below. Securely tighten. Refer to Detail “A” of FIGURE 15.3:
 - A. Secure NEGATIVE (-) BLACK battery cable to NEGATIVE (-) battery terminal using the mounting screw and the locknut.
 - B. Connect POSITIVE (+) RED battery cable to POSITIVE (+) battery terminal using the mounting screw with fuse and the locknut.
3. Verify all battery cables/ring terminals are correctly installed and securely tightened.
4. Slide terminal cap(s) down battery cables and onto battery clamps (Detail “B” of FIGURE 15.3).
5. Secure each terminal cap in place with a tie-wrap [use tie-wraps 11-1/2-inches long] (DETAIL “B” in FIGURE 15.3).
6. Position the batteries into the wheelchair. Refer to Removing/Installing Batteries from/into Battery Tray on page 162.

NOTE: New Batteries MUST be fully charged BEFORE using, otherwise the life of the batteries will be reduced.

7. If necessary, charge the batteries. Refer to Charging Batteries on page 167.

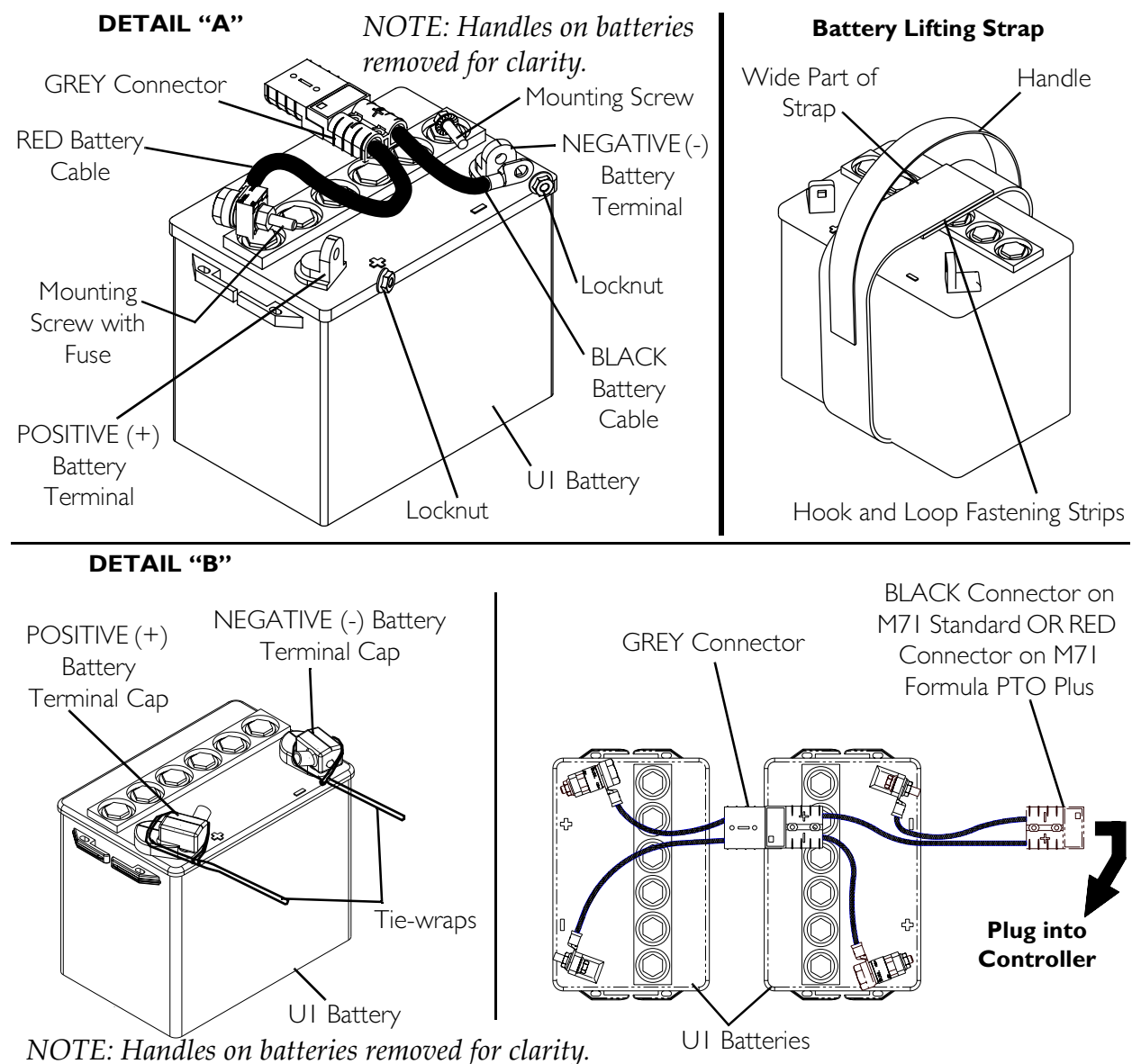


FIGURE 15.3 Connecting/Disconnecting Battery Cables

Disconnecting Battery Cables

WARNING

The use of rubber gloves is recommended when working with batteries.

NEVER allow any of your tools and/or battery cables to contact **BOTH** battery terminals at the same time. An electrical short may occur and serious personal injury or damage may occur.

1. Tilt the seat back. Refer to Tilting the Seat Assembly on page 82.
2. Disconnect the front battery from the controller (BLACK connector on the standard M71 OR RED connector on M71 Formula PTO Plus).
3. Disconnect the rear battery from the front battery (GREY connector).
4. Lift the rear battery out of the base frame.
5. Slide front battery rearward and lift out of base frame.
6. Cut the tie-wrap that secures the battery terminal cap in place. See Detail “B” in FIGURE 15.3.
7. Slide terminal cap(s) up on the battery cables.
8. Disconnect POSITIVE (+) RED battery cable from the POSITIVE (+) battery terminal (FIGURE 15.3).
9. Disconnect NEGATIVE (-) BLACK battery cable from NEGATIVE (-) battery terminal (FIGURE 15.3).
10. If equipped with battery lifting straps, separate the hook and loop fastening strips and remove the straps from the batteries.

Charging Batteries

WARNING

Never attempt to recharge the batteries by attaching cables directly to the battery terminals.

DO NOT attempt to recharge the batteries and operate the wheelchair at the same time.

DO NOT attempt to recharge the batteries when the wheelchair has been exposed to **ANY** type of moisture.

DO NOT attempt to recharge the batteries when the wheelchair is outside.

DO NOT sit in the wheelchair while recharging the batteries.

DO NOT attempt to recharge the batteries using both the on-board battery charger and an independent battery charger (plugged into the joystick charger port) at the same time. Doing so will reduce the life of the batteries.

⚠ WARNING

READ and CAREFULLY follow the individual instructions for each charger (supplied or purchased). If charging instructions are not supplied, consult a qualified technician for proper procedures.

CAUTION

New batteries **MUST** be fully charged prior to initial use of the wheelchair.

Always charge new batteries before initial use or battery life will be reduced.

As a general rule, you should recharge your batteries as frequently as possible to assure the longest possible life and to minimize required charging time. Plan to recharge them when you do not anticipate using the wheelchair.

Basic concepts which will help you understand this automatic process are:

The amount of electrical current drawn within a given time to charge a battery is called “charge rate”. If, due to usage, the charge stored in the battery is low, the charge rate is high. As a charge builds up, the charge rate is reduced, and the battery charger rate decreases to a “trickle charge”.

NOTE: If the batteries need to be charged more often or take longer to charge than normal, they may need to be replaced. Contact a qualified technician.

NOTE: The batteries can be charged using the on-board battery charger OR by plugging an independent battery charger into the port located on the front of the joystick.

Battery Charger Operation

⚠ DANGER

When using an extension cord, use only a three wire extension cord having at least **16 AWG (American Wire Gauge)** wire and the same or higher electrical rating as the device being connected. Use of improper extension cord could result in a risk of fire and electric shock. Three prong to two prong adapters should not be used. Use of three prong adapters can result in improper grounding and present a shock hazard to the user.

⚠ WARNING

READ and CAREFULLY follow the manufacturer’s instructions for each charger (supplied or purchased). If charging instructions are not supplied, consult a qualified technician for proper procedures.

NEVER leave the charger unattended when the circuit breaker (charger) is tripping **ON and OFF**.

On-Board Battery Charger

DANGER

When using an extension cord, use only a three wire extension cord having at least 16 AWG (American Wire Gauge) wire and the same or higher electrical rating as the device being connected. Use of improper extension cord could result in a risk of fire and electric shock. Three prong to two prong adapters should not be used. Use of three prong adapters can result in improper grounding and present a shock hazard to the user.

WARNING

Ensure the pins of the extension cord plug are the same number, size, and shape as those on the charger.

DO NOT, under any circumstances, cut or remove the round grounding plug from the charger AC cable plug or the extension cord plug.

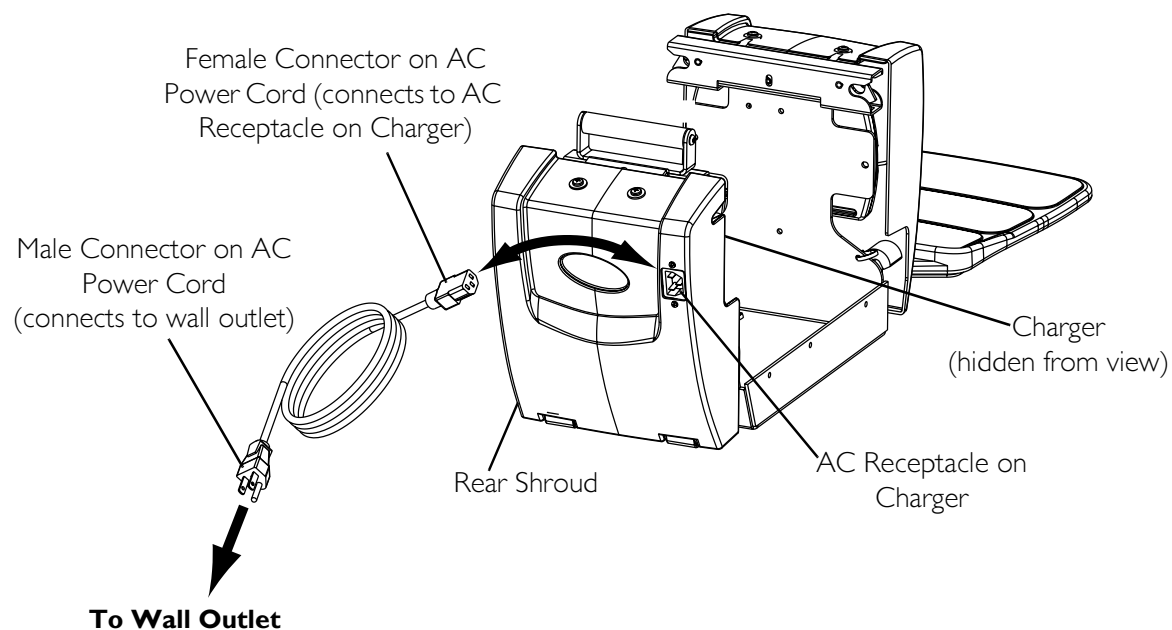
NOTE: For this procedure, refer to FIGURE 15.4 on page 170.

NOTE: The On/Off LED indicator light and the charger LED indicator light are located on the top of the charger on the rear of the wheelchair. Open rear shroud to view indicator lights.

1. Plug the female connector of the AC power cord (supplied) to the AC receptacle on the charger and plug in the male connector on the AC power cord into the wall outlet.
 2. The On/Off LED indicator illuminates solid RED indicating that the charger is ON.
 3. If the On/Off LED indicator is “blinking” RED, this is abnormal. Unplug AC power cord from the on-board battery charger and wall outlet. Contact Invacare at the number listed on the back page of this manual.
 4. When the On/Off LED indicator light is Off, charger is Off.
 5. When the CHARGE LED indicator light is YELLOW, the batteries are charging.
 6. When the CHARGE LED indicator light is solid GREEN, the batteries are fully charged (as their condition will allow). At this point, the charger automatically stops charging.
 7. When charging is complete, unplug the male connector of the AC power cord from the wall outlet and then unplug the female connector of the AC power cord from the AC receptacle on the charger.
-

WARNING

DO NOT operate wheelchair with AC power cord attached to the wheelchair.



ON/OFF INDICATOR	STATUS
SOLID RED	Charger On
“BLINKING” RED	Abnormal
LED “OFF”	Charger Off

CHARGING INDICATOR	STATUS
YELLOW	Charging
“BLINKING” GREEN	Output not connected
SOLID GREEN	Fully charged
LED “OFF”	Charger disconnected

FIGURE 15.4 On-Board Battery Charger

Charging Using an Independent Charger Plugged Into the Joystick

⚠ WARNING

READ and CAREFULLY follow the individual instructions for each charger (supplied or purchased). If charging instructions are not supplied, consult a qualified technician for proper procedures.

DO NOT attempt to recharge the batteries using **BOTH** the on-board battery charger **AND** an independent battery charger (plugged into the joystick charger port) at the **SAME** time. Doing so will reduce the life of the batteries.

CAUTION

Only use a charger approved by Invacare when charging through the joystick on this wheelchair model.

DO NOT use an independent charger with an output rating of over 8A (Amps). Otherwise, damage may occur.

NOTE: For this procedure, refer to FIGURE 15.5.

NOTE: The charger port located on the front of the joystick requires the use of an independent charger. The independent charger is NOT supplied with the wheelchair.

1. Attach the battery charger connector to the charger port on the front of the joystick.
2. Plug the charger's AC power cord or extension into the grounded 110-volt wall outlet.
3. When charging is complete, turn charger off.
4. Disconnect output cable from joystick charger port.

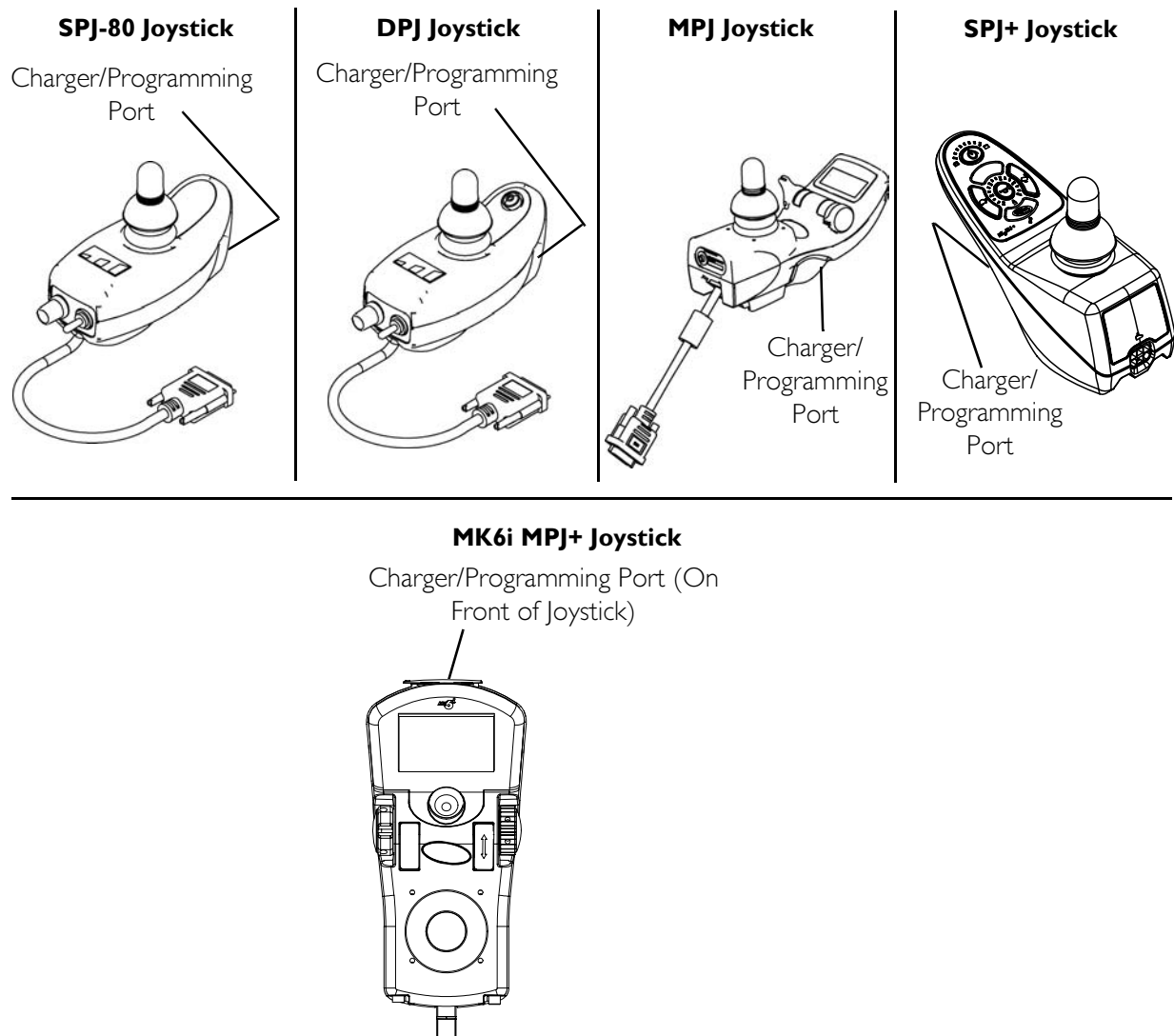


FIGURE 15.5 Charging Using an Independent Charger Plugged Into the Joystick

SECTION 16—TDX BATTERIES

⚠ WARNING

After **ANY** adjustments, repair or service and **BEFORE** use, make sure all attaching hardware is tightened securely - otherwise injury or damage may occur.

Warnings for Handling and Replacing Batteries

⚠ WARNING

Make sure power to the wheelchair is **OFF** before performing these procedures.

The use of rubber gloves is recommended when working with batteries.

Invacare strongly recommends that battery installation and battery replacement always be done by a qualified technician.

After **ANY** adjustments, repair or service and **BEFORE** use, make sure all attaching hardware is tightened securely - otherwise injury or damage may result.

22NF batteries weigh 37 pounds each. GP24 batteries weigh 51 pounds each. Use proper lifting techniques (lift with your legs) to avoid injury.

Use MK p/n M24SLDG or p/n M22NFSLDG batteries only. Failure to use the correct battery size and/or voltage may cause damage to your wheelchair and give you unsatisfactory performance.

ALWAYS use a battery lifting strap when lifting a battery. It is the most convenient method and assures that the battery acid will not spill. It also helps to prolong the life of the battery.

DO NOT tip the batteries. Keep the batteries in an upright position.

NEVER allow any of your tools and/or battery cable(s) to contact **BOTH** battery post(s) at the same time. An electrical short may occur and serious personal injury or damage may occur.

When tightening the clamps, always use a box wrench. Pliers will “round off” the nuts. **NEVER** wiggle the battery terminal(s)/post(s) when tightening. The battery may become damaged.

The **POSITIVE (+) RED** battery cable **MUST** connect to the **POSITIVE (+)** battery terminal(s)/post(s), otherwise serious damage will occur to the electrical system.

Install protective caps on **POSITIVE (+)** and **NEGATIVE (-)** battery terminals.

DO NOT remove fuse or mounting hardware from **POSITIVE (+) RED** battery cable mounting screw.

NOTE: If there is battery acid in the bottom of the battery tray or on the sides of the batteries, apply baking soda to these areas to neutralize the battery acid. Before reinstalling the existing or new batteries, clean the baking soda from the battery tray or batteries being sure to avoid contact with skin and eyes. Determine source of contamination. Never install/reinstall a battery with a cracked or otherwise damaged case.

Using the Proper Batteries

NOTE: For this procedure, refer to FIGURE 16.1.

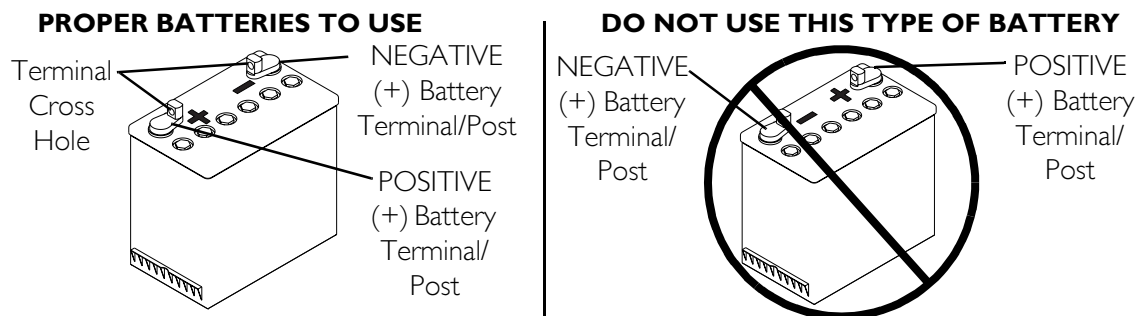
1. Position battery on ground/flat surface as shown below.
2. Visually inspect the battery to ensure proper polarity:

⚠ WARNING

FOR WHEELCHAIRS THAT USE 22NF BATTERIES

Batteries with terminal configuration (POSITIVE on the left and NEGATIVE on the right) as shown below MUST be used. Batteries that have the reverse terminal configuration MUST not be used - otherwise injury and damage may occur.

Terminals MUST have a cross hole in them as shown below.



⚠ WARNING

FOR WHEELCHAIRS THAT USE GP24 BATTERIES

Batteries with terminal configuration (POSITIVE on the right and NEGATIVE on the left) as shown below MUST be used. Batteries that have the reverse terminal configuration MUST not be used - otherwise injury and damage may occur.

Terminals MUST have a cross hole in them as shown below.

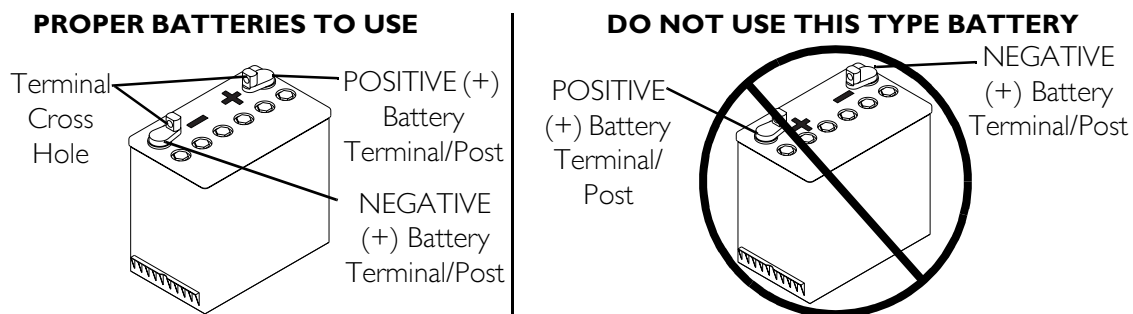


FIGURE 16.1 Using the Proper Batteries

Replacing Batteries

NOTE: For this procedure, refer to FIGURE 16.2 on page 176.

NOTE: The following tools are required to perform this procedure.

- Wire Cutter
1. Remove the batteries from the wheelchair. Refer to Removing/Installing the Batteries From/Into the Wheelchair on page 177.
 2. Cut the tie-wraps that secure the battery terminal covers to the battery terminals.
 3. Slide the RED battery terminal cover back on the RED battery cable to expose the POSITIVE battery terminal.
 4. Slide the BLACK battery terminal cover back on the BLACK battery cable to expose battery terminal.

⚠ WARNING

NEVER allow any of your tools and/or battery cable(s) to contact BOTH battery post(s) at the same time. An electrical short may occur and serious personal injury or damage may occur.

5. Remove the locknut that secures the bracket of the POSITIVE battery cable to the POSITIVE (+) battery post of the battery.
6. Remove the locknut that secures the NEGATIVE battery cable to the NEGATIVE(-) battery post of the battery
7. Discard the existing battery.
8. Position battery connector bracket or wiring harness onto the new 22NF or GP24 battery as shown.
9. Secure the NEGATIVE battery cable to the NEGATIVE (-) battery post with existing mounting screw and locknut.
10. Secure the bracket of the POSITIVE battery cable to the POSITIVE (+) battery post with existing mounting screw and locknut.
11. Position each battery terminal cover over top of each battery terminal.
12. Secure battery terminal covers in place with one tie-wrap.
13. Install batteries into wheelchair. Refer to Removing/Installing the Batteries From/Into the Wheelchair on page 177.

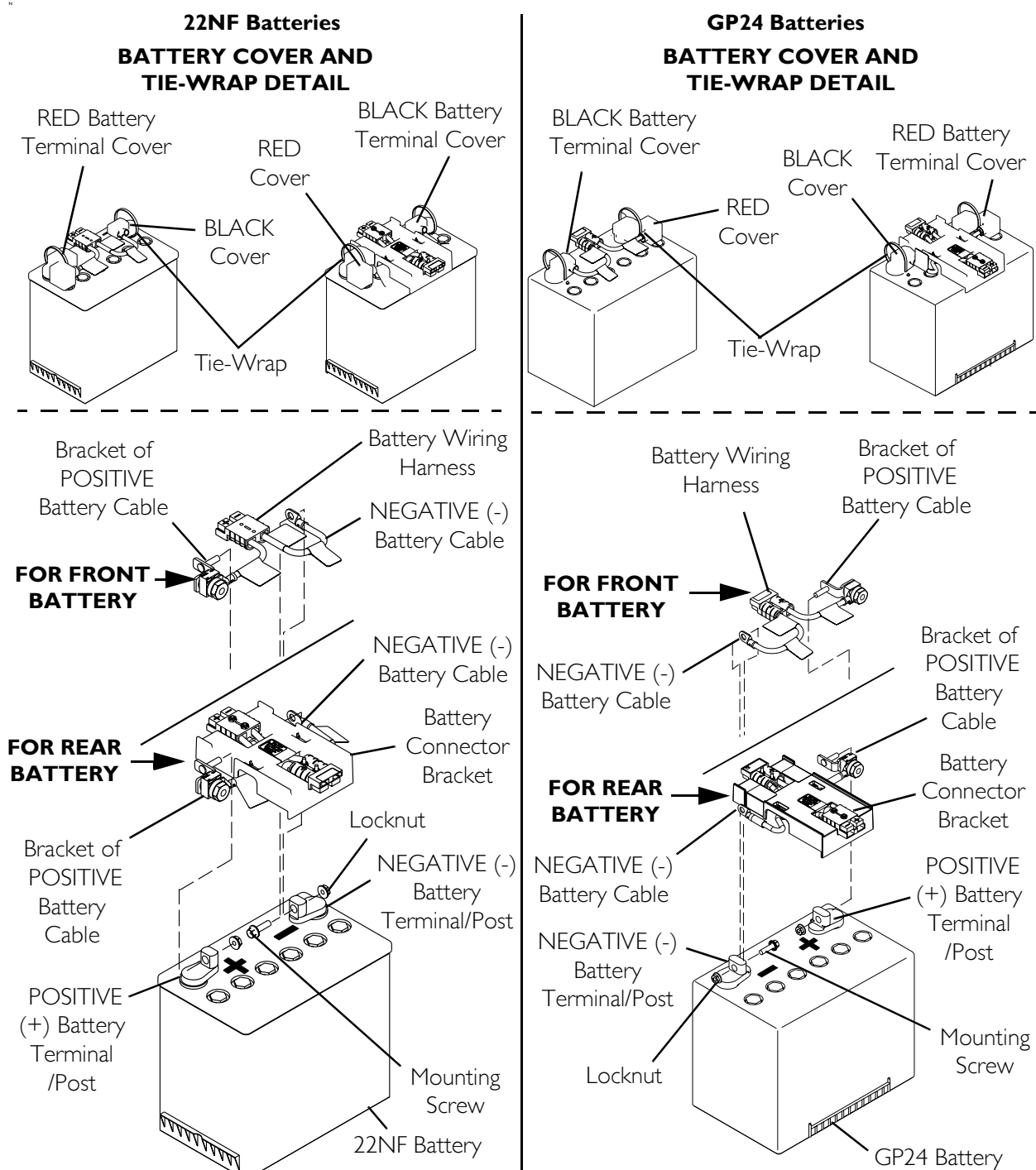


FIGURE 16.2 Replacing Batteries

Removing/Installing the Batteries From/Into the Wheelchair

Removing the Battery Door and Rear Shrouds

CAUTION

Place the wheelchair in a well ventilated area where work can be performed without risking damage to carpeting or floor covering.

NOTE: For this procedure, refer to FIGURE 16.3 on page 178 and FIGURE 16.4 on page 179.

1. Verify the joystick On/Off switch is in the Off position.
2. Remove the two thumb screws that secure the rear shroud to the wheelchair.
3. Remove the rear shroud from the wheelchair.
4. TRRO and TRBKTS Options Only - Perform the following steps:
 - A. Remove two thumb screws that secure the top controller shroud (FIGURE 16.4) to the battery box.
 - B. Remove the top controller shroud from the battery box.
5. Tilt the PTO Plus back. Refer to Tilting the Seat Assembly on page 82.
6. Remove both mounting screws from side of battery door.
7. Remove the battery door from the front of wheelchair.
8. TRRO and TRBKTS Options Only - Perform the following steps (FIGURE 16.4):
 - A. Remove the four screws and four locknuts (if applicable) that secure the battery support bracket to the battery box.
 - B. Remove the battery support bracket.
9. Disconnect the controller from the batteries at the rear of the wheelchair.
10. Remove the batteries. Refer to Removing the Batteries from the Wheelchair on page 179.

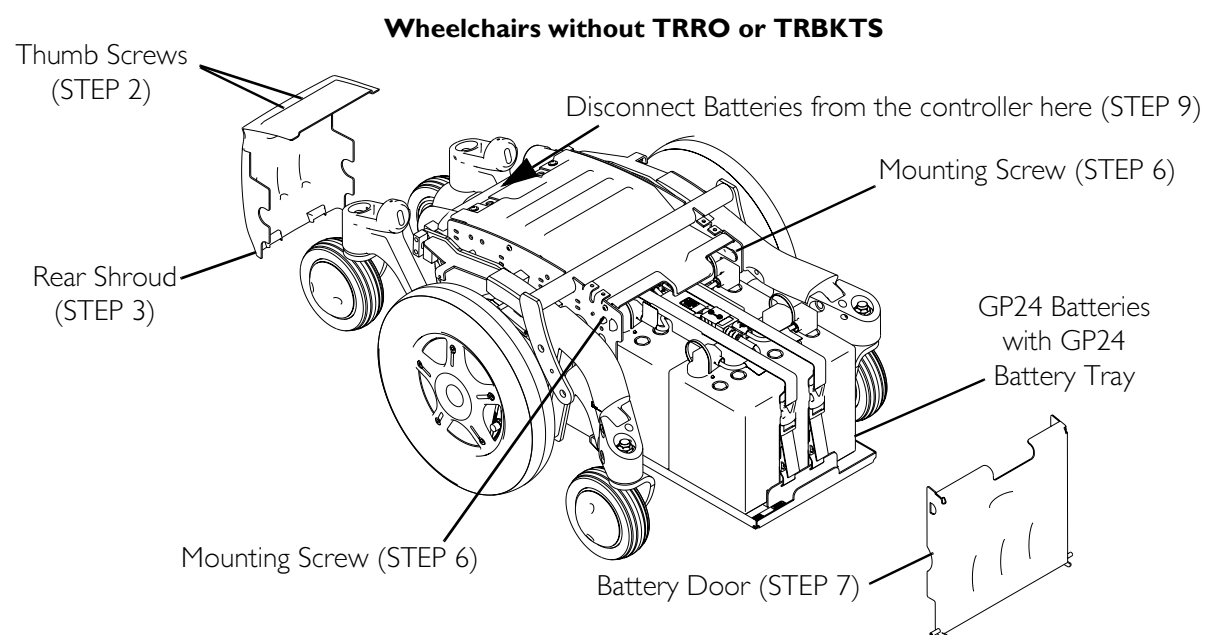


FIGURE 16.3 Removing the Battery Door and Rear Shrouds - Wheelchairs without TRRO or TRBKTS

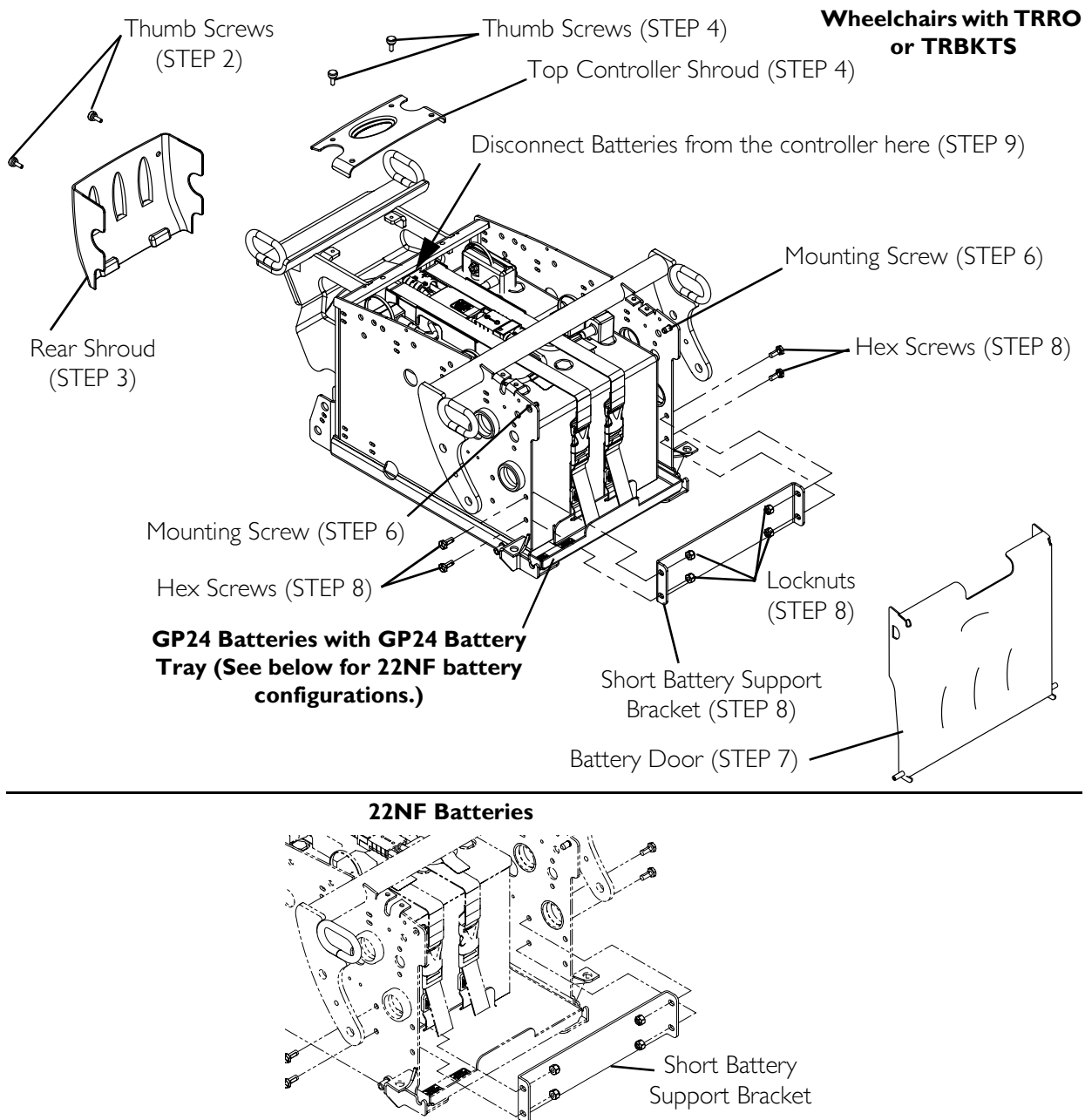


FIGURE 16.4 Removing the Battery Door and Rear Shrouds/Installing the Battery Door and Rear Shroud - Wheelchairs with TRRO and TRBKTS

Removing the Batteries from the Wheelchair

NOTE: For this procedure, refer to FIGURE 16.5 on page 180.

1. If wheelchair is equipped with ventilator tray, perform the following steps:

NOTE: Refer to DETAIL "A" in FIGURE 16.5.

- A. Disconnect ventilator battery from wiring harness.
- B. Disconnect the strap that secures the ventilator battery to the tray.
- C. Remove the ventilator battery.

2. Slide battery tray with batteries out.
3. Disconnect the battery straps.
4. Unplug front battery from rear battery.
5. Remove the front battery.
6. Slide the rear battery forward and remove it from the tray.

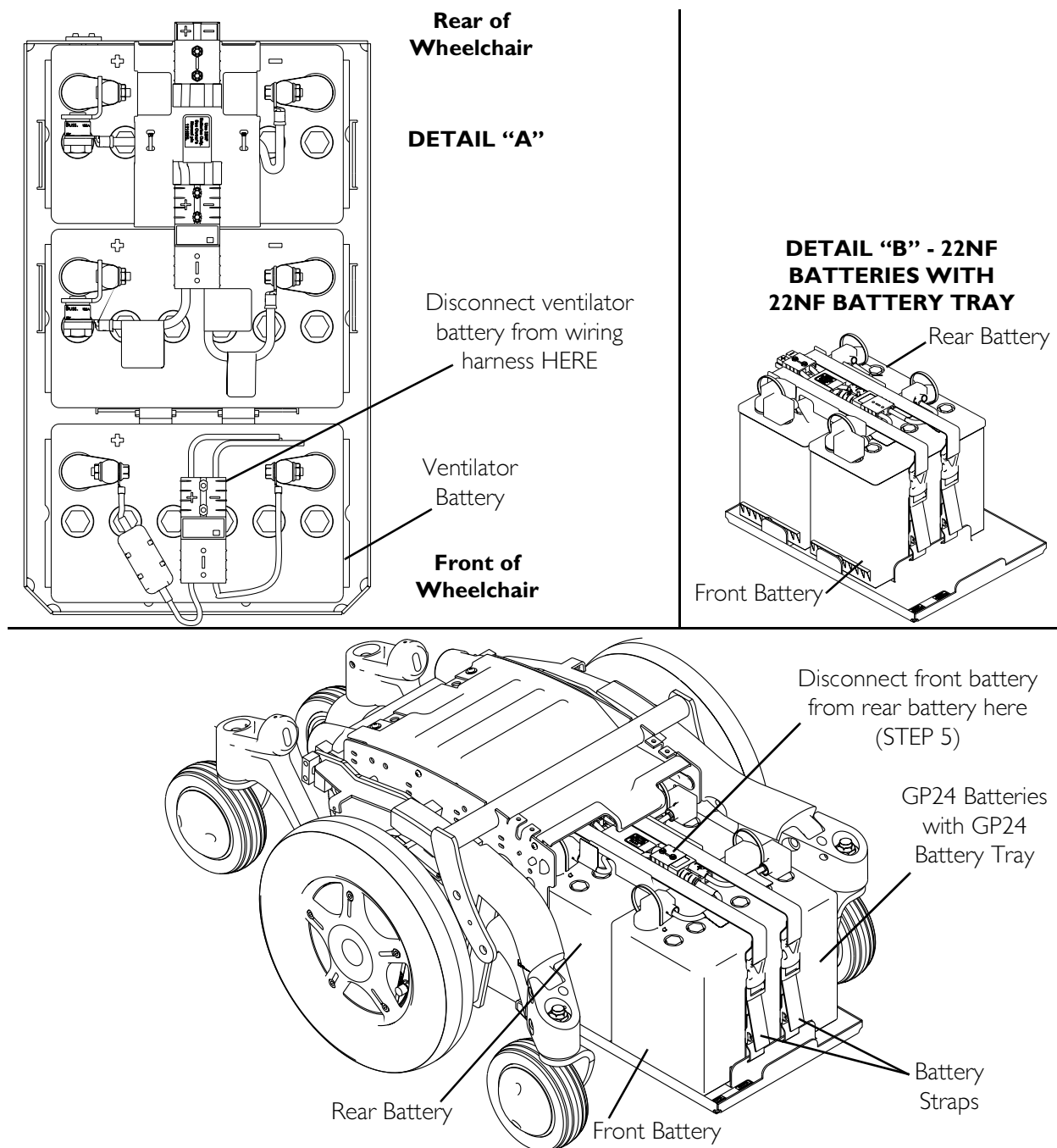


FIGURE 16.5 Removing the Batteries from the Wheelchair

Installing Batteries into the Wheelchair

NOTE: For this procedure, refer to FIGURE 16.5 on page 180 and FIGURE 16.6 on page 182.

NOTE: Positioning of the batteries into the battery tray is completed with battery tray positioned in wheelchair and partially pulled out. Refer to FIGURE 16.5 for full view of wheelchair base.

Illustrations in FIGURE 16.6 are shown without the wheelchair for clarification purposes only.

1. Position the battery with battery connector bracket in the REAR of the battery tray in the orientation as shown. See DETAIL “A”.

NOTE: Front of battery tray is designated by the battery stop. Rear of the battery tray is the opposite end.

NOTE: Orientation of the battery is critical otherwise batteries will not connect to the controller or each other.

2. Position the remaining battery in the FRONT of the battery tray in the orientation shown so that the wiring harnesses can be connected together. See DETAIL “B”.
3. Connect front battery to rear battery. See DETAIL “B”.
4. Connect battery straps. See DETAIL “C”.
5. Slide the battery tray into the wheelchair.

NOTE: Refer to FIGURE 16.5.

6. If wheelchair is equipped with ventilator tray, perform the following:
 - A. Install ventilator battery in the orientation.
 - B. Connect ventilator battery to wiring harness.
 - C. Connect the strap to secure the ventilator battery to the tray.
7. Install the battery door and rear shroud. Refer to Installing the Battery Door and Rear Shroud on page 182.

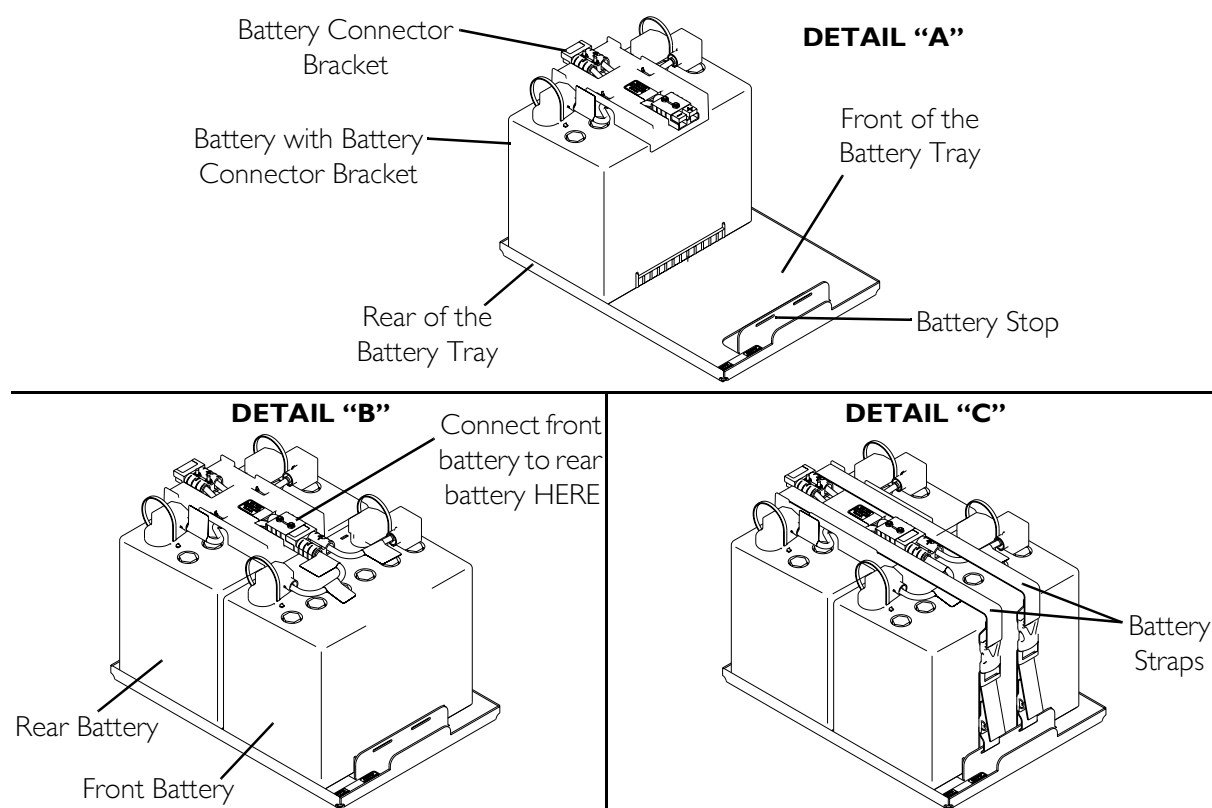


FIGURE 16.6 Installing Batteries into the Wheelchair

Installing the Battery Door and Rear Shroud

⚠ WARNING

Wheelchairs with TRRO or TRBKTS Only - Battery support brackets **MUST be installed at all times. Otherwise, the wheelchair will not be WC/19 compliant.**

After installing battery door, ensure that the mounting screws on the side of the battery door are fully engaged into the side of the battery box.

NOTE: For this procedure, refer to FIGURE 16.3 on page 178 and FIGURE 16.4 on page 179.

1. Wheelchairs with TRRO and TRBKTS Only - Install the battery support bracket onto the battery box (FIGURE 16.4 on page 179) using the four hex screws and four locknuts (if applicable). Torque to 75 in-lbs.

NOTE: The installation of the battery support bracket depends on the type of battery and options on the wheelchair. Refer to the correct configuration in FIGURE 16.4 on page 179.

2. Reinstall battery door onto front of wheelchair.
3. Install both mounting screws on the side of the battery door.

NOTE: Ensure that the mounting screws on the side of the battery door are fully engaged into the side of the battery box.

⚠ WARNING

When installing batteries, ensure battery connector is securely engaged to the controller connector - otherwise serious personal injury may result.

4. Connect the controller to the batteries at the rear of the wheelchair.
5. Wheelchairs with TRRO and TRBKTS Only - Reinstall the top controller shroud using the two thumb screws (FIGURE 16.4 on page 179).
6. Reinstall the rear shroud and secure in place with the existing two thumb screws.

NOTE: New Batteries MUST be fully charged before using, otherwise the life of the batteries will be reduced.

7. Tilt the seat forward. Refer to Tilting the Seat Assembly on page 82.
8. If necessary, charge the batteries. Refer to Charging Batteries on page 124.

Cleaning Battery Terminals

⚠ WARNING

Most batteries are not sold with instructions. However, warnings are frequently noted on the cell caps. Read them carefully.

DO NOT allow the liquid in the battery to come in contact with skin, clothes or other possessions. It is a form of acid and harmful or damaging burns may result. Should the liquid touch your skin, wash the area IMMEDIATELY and thoroughly with cool water. In serious cases or if eye contact is made, seek medical attention IMMEDIATELY.

1. Examine battery terminals for corrosion.
2. Verify the plastic caps are in place over battery cell holes.
3. Clean terminals by using a battery cleaning tool, wire brush, or medium grade sand paper.

NOTE: Upon completion, areas should be shiny, not dull.

4. Carefully dust off all metal particles.

When to Charge Batteries

SPJ+ Joysticks

NOTE: For this procedure, refer to FIGURE 16.7.

The Information Gauge Display located on the front of the joystick housing provides the state-of-battery charge, including notification of when the battery requires charging. It also provides the following information to the user on the status of the wheelchair:

- A. GREEN LEDs indicate well charged batteries.
- B. AMBER LEDs indicate batteries are moderately charged. Recharge batteries before taking a long trip.
- C. RED LEDs indicate batteries are running out of charge. Recharge batteries as soon as possible.

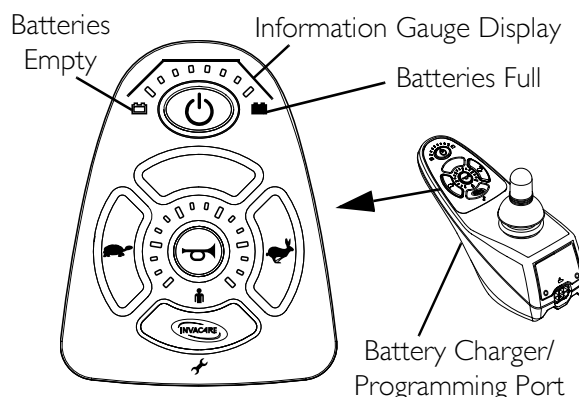


FIGURE 16.7 SPJ+ Joysticks

MK6i MPJ+ Joystick

NOTE: For this procedure, refer to FIGURE 16.8.

The far right side of the display screen is the Battery Gauge Display (BGD). It provides information on the remaining charge in the batteries.

At full charge, solid blocks fill in all ten segments between E (Empty) and F (Full). As the battery becomes discharged, the segments will progressively disappear a bar at a time until no segments appear between E and F. At this level the user should charge the batteries as soon as possible.

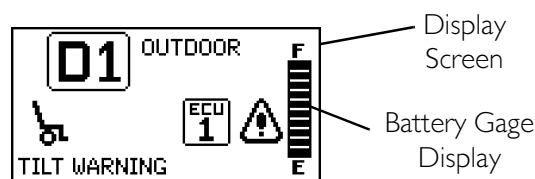


FIGURE 16.8 MK6i MPJ+ Joystick

DPJ and SPJ-80 Joystick

NOTE: For this procedure, refer to FIGURE 16.9.

The Battery Gauge Display (BGD) is a bar graph display located on the MK5 joystick. It will keep you informed as to power availability. A visual warning is given before the power becomes too low to operate the wheelchair. At full charge, the two LEFT segments and the farthest RIGHT segment of the bar graph will be illuminated. As the battery becomes discharged, the farthest RIGHT segment will progressively move to the LEFT until only the last two bars (LEFT) are illuminated. At this level the last two bars (LEFT) will start to Flash ON and OFF to indicate that the end user should charge the batteries as soon as possible.

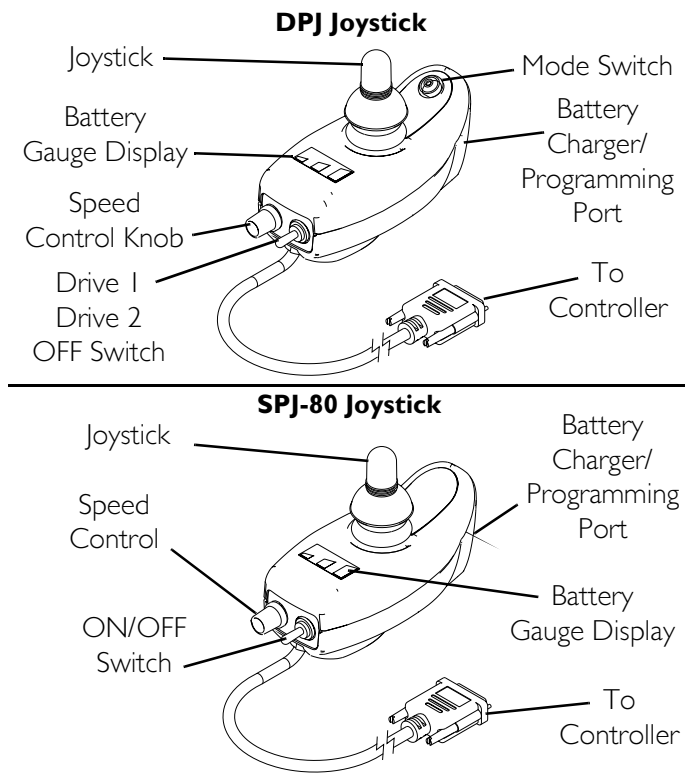


FIGURE 16.9 DPJ and SPJ-80 Joystick

MPJ Joystick

NOTE: For this procedure, refer to FIGURE 16.10.

The left half of the second line is the Battery Gauge Display (BGD). It provides information on the remaining charge in the batteries. At full charge, solid blocks fill in all five segments between E (Empty) and F (Full). As the battery becomes discharged, the farthest right segments will progressively disappear a half bar at a time until no segments appear between E and F. At this level, the word RECHARGE will appear on the second line to indicate that the user should charge the batteries as soon as possible.

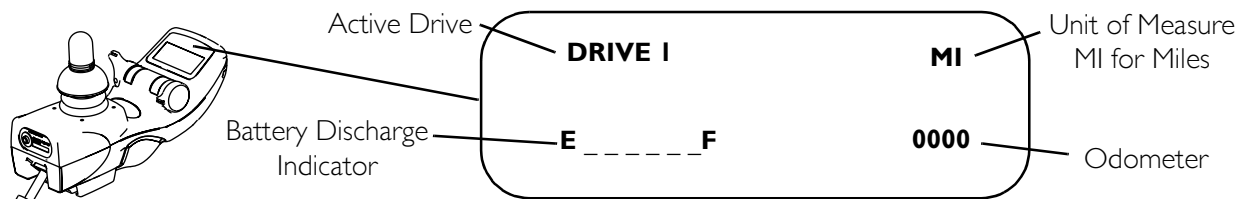


FIGURE 16.10 MPJ Joystick

Charging Batteries

⚠ WARNING

NEVER attempt to recharge the batteries by attaching cables directly to the battery terminals or clamps. **ALWAYS** use the recharging plug located on the back of the joystick.

DO NOT attempt to recharge the batteries and operate the power wheelchair at the same time.

During use and charging, unsealed batteries will vent hydrogen gas which is explosive in the right concentration with air.

CAUTION

Always charge new batteries before initial use or battery life will be reduced.

NOTE: For this procedure, refer to FIGURE 16.11 on page 187.

NOTE: New batteries MUST be fully charged prior to initial use of the wheelchair.

NOTE: As a general rule, batteries should be recharged daily to assure the longest possible life and minimize the required charging time. Plan to recharge the batteries when it is anticipated the wheelchair will not be used for a long period of time.

The range per battery charge using recommended batteries should be approximately 5 to 9 hours of typical operation. Extensive use on inclines may substantially reduce per charge mileage.

Description and Use of Battery Chargers

The charger automatically reduces the charge from an initially high rate to a zero reading at a fully charged condition. If left unattended, the charger should automatically shut-off when full charge is obtained.

There are some basic concepts which will help you understand this automatic process. They are:

The amount of electrical current drawn within a given time to charge a battery is called the “charge rate”. If, due to usage, the charge stored in the battery is low, the charge rate is high, as indicated by the GREEN light on the charger. Initially, the GREEN light will stay illuminated for a short period of time followed by a longer period of off time. As a charge builds up, the charge rate is reduced, and the GREEN light will stay illuminated for a longer period of time followed by a shorter off time.

⚠ WARNING

NEVER leave the charger unattended when the breaker has tripped. A fault condition exists. **Unplug and discontinue using immediately. Contact an Invacare dealer.**

NOTE: If performing the charging procedures independently, READ and CAREFULLY follow the individual instructions for each charger (supplied or purchased).

NOTE: If charging instructions are not supplied, consult a qualified service technician for proper procedures.

Required Items:

TOOL	QUANTITY	COMMENTS
Battery Charger	1	Supplied
Extension Cord	1	Not Supplied

1. Attach the battery charger connector to the charger port on the joystick.
2. Plug the charger's AC power cord, or extension, into the grounded 120 VAC wall outlet.
3. Wait until charging is complete.

NOTE: Allow eight hours for normal charging. Larger batteries (greater than 55 ampere-hours) or severely discharged batteries may require up to sixteen hours to be properly charged and equalized.

NOTE: It is advantageous to recharge frequently rather than only when necessary. In fact, a battery's life is extended if the charge level is maintained well above a low condition.

NOTE: If the batteries need to be charged more often or take longer to charge than normal, they may need to be replaced. Contact an Invacare dealer for service.

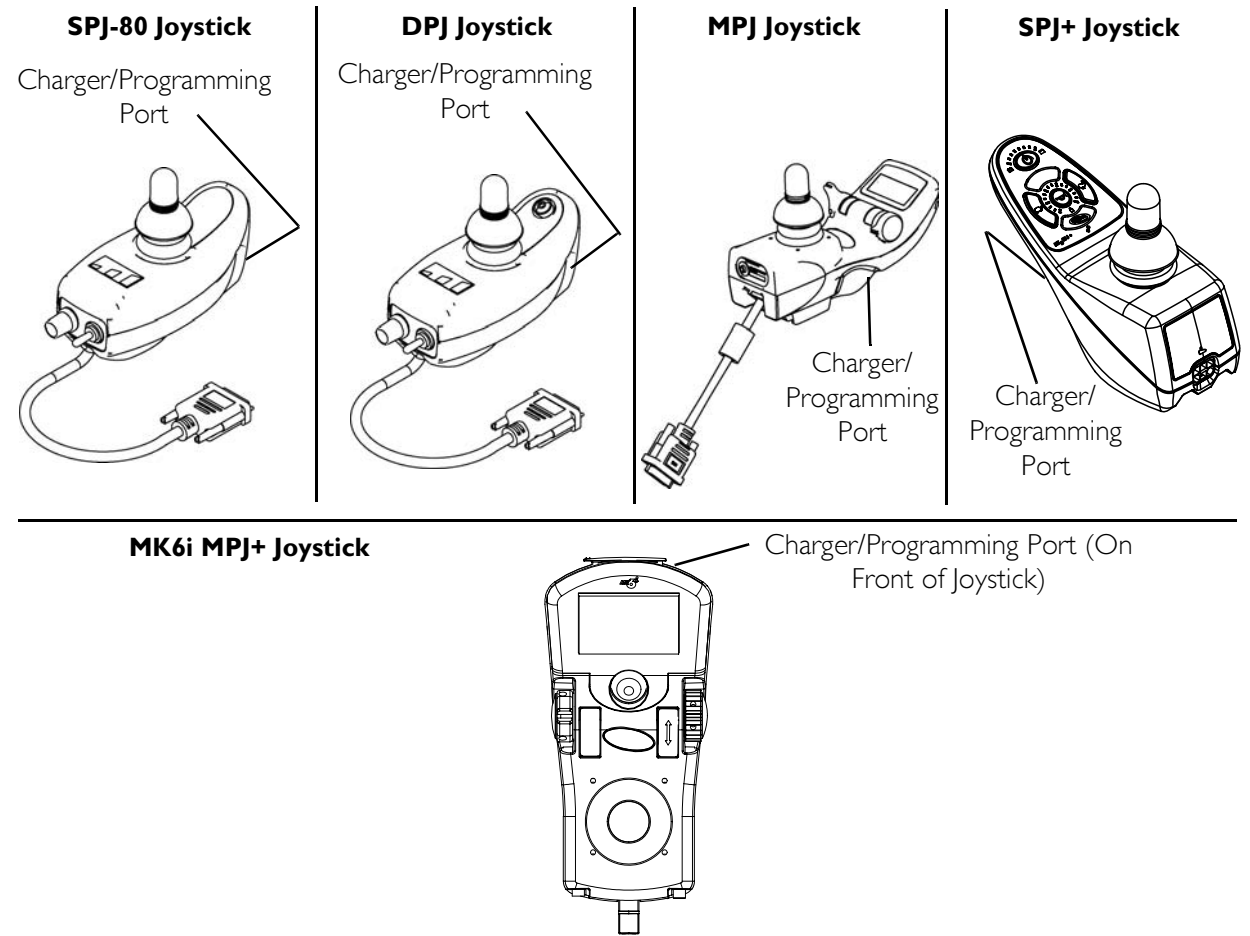


FIGURE 16.11 Charging Batteries

LIMITED WARRANTY

For warranty information, please refer to the original owner's manual which came with this product, or contact Invacare for more information.



Yes, you can.®

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